MONTHLY WEATHER REVIEW.

Editor: Prof. Cleveland Abbe. Assistant Editor: Frank Owen Stetson.

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The Monthly Weather Review is based on data from about 3500 land stations and many ocean reports from vessels taking the international simultaneous observation at Greenwich noon.

Special acknowledgment is made of the data furnished by the kindness of cooperative observers, and by Prof. R. F. Stupart, Director of the Meteorological Service of the Dominion of Canada; Señor Manuel E. Pastrana, Director of the Central Meteorological and Magnetic Observatory of Mexico; Camilo A. Gonzales, Director-General of Mexican Telegraphs; Capt I. S. Kimball, General Superintendent of the United States Life-Saving Service; Commandant Francisco S. Chaves, Director of the Meteorological Service of the Azores, Ponta Delgada, St. Michaels, Azores; W. N. Shaw, Esq., Director Meteorological Office, London; H. H. Cousins, Chemist, in charge of the Jamaica Weather Office; Rev. L. Gangoiti, Director of the Meteorological Observatory of Belen College, Havana, Cuba.

As far as practicable the time of the seventy-fifth meridian is used in the text of the Monthly Weather Review.

Barometric pressures, both at land stations and on ocean vessels, whether station pressures or sea-level pressures, are reduced, or assumed to be reduced, to standard gravity, as well as corrected for all instrumental peculiarities, so that they express pressure in the standard international system of measures, namely, by the height of an equivalent column of mercury at 32° Fahrenheit, under the standard force, i. e., apparent gravity at sea level and latitude 45°.

FORECASTS AND WARNINGS.

By Prof. E. B. Garriott, in charge of Forecast Division.

A EUROPEAN COLD WAVE.

During the third decade of the month a cold wave of exceptional severity visited central and southern Europe. In central Russia there was a heavy loss of life and live stock by cold and heavy snow. Southern Russia and the Black Sea were swept by gales of great violence, attended by snow and intense cold. The harbor at Odessa was frozen over, and railroad lines in that region were buried in snow. The cold wave extended to the Mediterranean, and heavy snow fell in Turkey, Greece, Crete, and Asia Minor. The lagoons were frozen at Venice, while at Florence the cold was unprecedented and the River Arno was frozen. In the Alps the weather was intensely cold, 25° F. below zero being reported. Vienna reported the coldest weather in fifty years. In Germany the barometer is reported to have reached a height unsurpast in the meteorological records of that country, and the temperature was the lowest recorded in twenty years, a minimum of 2° F. below zero being noted at Berlin. In Paris morning temperatures ranged from 14° to 20°. On the North Sea violent northeast gales were experienced. The cold wave extended over the British Isles with the heaviest snowfall in many years, four to six inches of snow being reported in Scotland and northern England.

The arrangement of barometric pressure that was preliminary and favorable to the setting in of this cold wave was shown on the morning of the 19th when a depression appeared over the Black Sea. At this time the barometer was highest, above 30.60 inches, from northern France over Germany and Denmark. By the 20th pressure had increased generally over central and northern Europe and western Siberia, with highest readings, above 30.80 inches, over northern European Russia. Over southwestern Europe the barometer had fallen rapidly. Pressure continued to increase over European Russia until the 22d, with a maximum reported reading of 31.42 inches at St. Petersburg. On the 23d the area inclosed by the isobar of 31.00 inches extended from central European Russia to the North and Baltic seas and the Gulf of Finland. On the morning of the 24th pressure had decreased rapidly over extreme southwestern Europe, the barometer reading at Lisbon being 29.42 inches. After the 24th barometric pressure over northern and western Europe diminished, the depression in the southwest apparently drifted northward over western Europe with a rapid decrease in intensity, and the cold moderated.

On the North Atlantic Ocean the weather was stormy during the second decade of the month.

Except in the extreme Northwest the first two decades of January were remarkably mild in the United States generally east of the Rocky Mountains. The balance of the month was cold, especially in the central valleys, Lake region, and Atlantic States. In New England the first half of the month was mild and the second half much colder than usual. During a cold wave on the 16–17th, temperatures 12° to 45° below zero were reported in Maine, and on the 24th readings were 25° below zero in the interior of New England. The principal cold wave of the month swept the middle and eastern districts in the third decade of the month, with freezing temperatures in the interior of the South Atlantic and east Gulf States, excepting Florida, on the 23d.

Precipitation was heavy in the central valleys, causing destructive floods in the Ohio and lower Mississippi rivers and tributaries, but was light in the Atlantic coast and Gulf States. Snowfall was unusually heavy in the Northern States from Minnesota to Idaho.

The severest gale of the month in the United States began on the Great Lakes the night of the 19th and continued during the 20th, causing great damage to vessels in harbors of the lower Lakes and lake side property.

A typhoon that resulted in a loss of 100 lives is reported as having swept the islands of Leyte and Samar, Philippine Islands, on the 10th.

BOSTON FORECAST DISTRICT.

The month as a whole was colder than the average, the mean temperature for New England, 20.5°, being 1.1° F. below the normal. During the first nine days the temperature was generally above normal. From the 10th to the 15th it was near the average. The weather became much colder on the 16th and 17th and from this time till the close of the month the temperatures were generally below normal. For the section as a whole the lowest temperature was on the 24th, when minimum readings of —25° or lower occurred in each State, except Rhode Island. During the cold wave of the 16–17th the temperatures were near or below zero in all sections, and 12° to 45° below zero in Maine. Many cooperative observers having records covering forty or more years state that the minimum temperature of the month is the lowest of record in January. There was an unusual amount of cloudiness, with precipitation on

an average on fifteen days. The monthly average precipitation for the entire district, 2.81 inches, is, however, 0.85 of an inch below the January normal. The depth of snowfall was not excessive, and ranged from 10 inches to slightly above 30 inches, the greatest fall being in parts of Maine. There were no storms during the month of greater severity than the average of those that occur at this season. The highest winds were general on the 9th and the 20th, with maximum velocities at coast stations between 36 and 56 miles per hour from the southwest, west, and northwest. There were no high easterly winds. So far as known there was no loss of vessels and no great damage to shipping during the month. Also there was less delay and inconvenience to shipping than is usually experienced in January, largely owing to the fact that the high winds and gales were offshore or westerly. No storms occurred for which warnings were not issued.—*J. W. Smith, District Forecaster.*

NEW ORLEANS FORECAST DISTRICT.

Weather conditions during the month were in many respects abnormal. Precipitation was deficient in Louisiana and southern Texas, and was in excess in Arkansas, Oklahoma, and northern Texas. The temperature was excessive in all parts of the district.

No storm warnings were issued during the month and no general storm occurred along the coast.

The only cold wave of any extent occurred on the 25th and 26th, when a sudden and decided fall in temperature occurred over the entire district and cold-wave temperatures were recorded, except at a few stations. Cold-wave warnings were issued for Louisiana, eastern Arkansas, and eastern Texas, except the northwest portion, on the 25th. Cold-wave warnings were issued for small areas on the 14th, 29th, and 30th, but in these cases the high-pressure areas and attendant cold weather either changed their course or were dissipated before coming into the district.

Frost or freezing temperature warnings were issued for considerable areas on the 25th and were fully verified, but warnings issued for limited areas on a few other dates failed of verification because of the sluggish movement of the high-pressure areas. No frost, without warnings, occurred in the sugar and trucking districts.—*I. M. Cline, District Forecaster.*

LOUISVILLE FORECAST DISTRICT.

The weather for January was unusually mild during the first nineteen days; ten days of this period showed maximum temperatures above 60°, and on several days they were above 70° F. The January record for high temperatures was broken at many points. Another remarkable feature was the extraordinarily heavy rainfall which occurred over the Ohio Valley, the larger portion of Kentucky, and the extreme western portion of Tennessee, the remainder of the district receiving less than normal. At Louisville the total precipitation was 12.11 inches, and amounts ranging between 10 and 13 inches were recorded at many other places. As most of this fell in the first three weeks, it means that one-fourth of the normal annual precipitation occurred in that short time. Disastrous and widespread floods resulted, not only in the Ohio River, but in all the rivers and small streams in the States bordering the Ohio. At Louisville there were about two thousand acres, or about one-seventh of the area of the city, under water. There were eighteen hundred houses in the submerged portion, with many factories, coal yards, lumber yards, and railroad tracks. Ten thousand people were directly affected by the high water, besides thousands temporarily out of employment. River traffic was suspended and the coal supply threatened. The estimated property loss was between $400,000 and $500,000. Timely warnings and advices as to the flood were issued from the Weather Bureau office, besides thousands of inquiries answered over the telephone.

Cold-wave warnings were issued for all or a part of the district on the 15th, 19th, 20th, 22d, 24th, 25th, 29th, and 30th. Five of these warnings were fully justified, one was fully verified, while two failed entirely because the high-pressure areas retreated and moved off rapidly to the north.—*F. J. Walz, District Forecaster.*

CHICAGO FORECAST DISTRICT. *Not received.*

DENVER FORECAST DISTRICT.

During four-fifths of the month low-pressure areas were either central in the district or so near as to exert a controlling influence to the extent that mild and unsettled weather predominated. In western Colorado the mean temperature was the highest of record, while in northern New Mexico and the greater part of Utah, the precipitation, which came principally in the form of rain, was exceptionally heavy for January.

There were no cold waves, and such cold periods as occurred were covered by forecasts and special warnings.—*Frederick H. Brandenburg, District Forecaster.*

SAN FRANCISCO FORECAST DISTRICT.

The month opened with cold weather and light north wind thruout most of the State. At San Diego a maximum wind of 36 miles per hour from the north occurred, and at Independence a maximum wind of 40 miles per hour from the same direction. Heavy frosts were general on the 1st and 2d, and in the southern portion of the State on the 3d. On the 3d a depression of considerable depth appeared on the northern coast. This past eastward and on the 5th frost warnings were issued for California. On the morning of the 6th heavy frost occurred thruout the State.

Snow fell on Mount Tamalpais, on the Berkeley Hills, and in the Coast Range. A marked depression quickly followed the cold wave. Heavy snow fell at numerous points. In some respects this was the heaviest snowfall in central California for many years. A brief interval of clear, cool weather was followed by another period of heavy rain, beginning the 13th. Heavy frost occurred at San Francisco on the 15th. Frost warnings were issued for the northern portion of the State on the same date. Heavy frost occurred on the 16th. Frost warnings were issued for northern California on the 17th and for southern California on the 18th and 19th. Heavy frost occurred on the 19th and 20th.

During the last decade the weather was unsettled with frequent showers, and the month ended with moderate rain and brisk southerly winds over the central and northern portions of the State.—*Alexander G. McAdie, Professor and District Forecaster.*

PORTLAND, OREG., FORECAST DISTRICT.

The month was abnormally cold, except in southern Idaho, where temperatures were about 2° F. above normal. At Portland the month was the coldest in seventeen years and much ice formed in the Columbia and Willamette rivers. In the Columbia River an ice gorge extended for several miles below The Dalles and navigation ceased between Portland and that city on the 10th, and was not resumed during the remainder of the month. The ice in the Willamette River was not sufficient at any time to interfere with navigation. The cold spell came on so gradually that cold-wave warnings were not required; the only one issued was for a limited portion of the district and it was not justified.

There were but few windstorms, the heaviest of which occurred on the 3d, when a maximum velocity of 84 miles was recorded at North Head, Wash. Timely warnings were issued for this and all the other storms sufficiently severe to need them. The heavy rains attending the storm of the 3d caused a sharp rise in the Willamette River and a flood occurred in the upper portion of the valley, but the subsequent cold weather so checked the rising waters that the stage in the lower portion of the valley was not sufficiently high to cause any material inconvenience.—*Edward A. Beals, District Forecaster.*

RIVERS AND FLOODS.

The flood of January, 1907, in the Ohio Valley was, below the mouth of the Great Kanawha River, one of the greatest of authentic history, the records in some cases extending back between seventy-five and ninety years.

In point of importance it ranks perhaps third, yielding only to the floods of 1883 and 1884, that of the latter year easily standing alone, when both extent of overflow and heights of flood planes are considered.

The precipitation conditions preceding and attending the three floods were very similar, except that in 1907 there was marked deficiency over the Tennessee watershed, while in 1884 there was a decided excess there, and a more moderate one in 1883. Chart X therefore gives a very good general idea of the precipitation that caused the three floods.

The floods of 1883 and 1907 were not at all unusual above the mouth of the Great Kanawha River, but that of 1884 easily exceeded all previous records, except at Pittsburg, where the crest stage of 33.3 feet was 1.7 feet below the great high-water stage of February 10, 1832. The excess in 1884 of 10 feet or more above the mouth of the Great Kanawha was doubtless responsible for that below; otherwise the stages at all three floods would have been practically alike. The cause of the upper river excess in 1884 is not entirely apparent. No detailed statement as to antecedent conditions was available, and a careful investigation of weather and temperature conditions failed to disclose any reason for the abnormally high stages of water. It is probable that unreported accumulated snows were largely responsible.

During the month of December, 1906, the precipitation was in excess from one to more than two inches over the entire watershed of the Ohio River with the exception of the Allegheny and Tennessee. The temperatures also were high for the season. The new year therefore found the soil supplied with water almost to the point of saturation, and almost entirely unfrozen. A period of persistent rains and snows set in immediately, and for nearly four weeks there was practically no relief. That a flood of great proportions was imminent very soon became apparent, the only questions in doubt being the crest stage, and the probability of the occurence of cold waves of sufficient intensity to check the rising waters. This question of the probability of cold waves was a very disturbing element in the situation as the season was very early, and severe January floods almost entirely unknown. An added element of danger was the fact that at the beginning of the month the river was much above the normal January stage, and rising, as a result of the rains and high temperature of the last two days of December, 1906.

The flood from Pittsburg, Pa., to Wheeling, W. Va., was of moderate character, the crest stage varying from 1.2 feet at the former to 0.9 foot above the flood stage at the latter place. Warnings were issued twenty-four hours in advance and no damage of consequence resulted. The one especial feature of the flood at Pittsburg was its long duration. Ordinarily a tide will run out in one or two days, but in this instance the water was near the flood stage from the 13th to the 21st, inclusive, a period of nine days, a result, of course, of the persistent rains.

In the Parkersburg district the flood conditions were a little more pronounced, with a crest stage at Parkersburg on the 21st, of 40.1 feet, 5.1 feet above the flood stage. There were three distinct flood crests in this district; on the 17th, 18th, and 21st. The first two were due to flood tides from the Muskingum and Little Kanawha rivers, while the last was the main flood wave. The river was above the flood stage at Parkersburg from the 17th to the 22d, inclusive; but aside from the inconvenience and discomfort, and the interruption of business, the actual loss in the district probably did not exceed $25,000.

From the mouth of the Great Kanawha River to Cairo conditions were greatly intensified, and the crest stages ranged from 8 to 15 feet above the flood stages, except between Paducah and Cairo. In the Cincinnati district warnings were first sent out on the 14th, and daily thereafter until the decline was well under way. While no undue alarming reports were issued, no effort was spared to impress upon all interested the extreme gravity of the situation, and the immediate necessity of using every precaution for the preservation of life and property. The crest stage at Cincinnati was 65.2 feet on the 21st, 15.2 feet above the flood stage. The river was above the 50-foot stage for eleven days, and above the 60-foot stage for five days. Had it not been for the timely occurrence of a cold wave between the 21st and 23d, it is very probable that the flood would have reached a height of 67 feet and ranked below that of 1884 only, as the high-water stage of February 15, 1883, was 66.4 feet. Stages above 60 feet at Cincinnati are of rare occurrence, as will be seen from the subjoined statement.

Year.	Date.	Stage.
1832	February 18	64.3
1847	December 17	63.7
1883	February 15	66.4
1884	February 14	71.1
1897	February 26	61.2
1898	March 29	61.4
1907	January 21	65.2

Never before was flood information in such general demand, and in respect to this, the Price Current took occasion to remark that "The Weather Bureau Office at Cincinnati has rendered very important service incident to the flood conditions in furnishing current information, and in pointing out what might be expected. The gradual rise, with the warnings, made it possible to do a great deal preparatory to conditions of inundation". Nevertheless there was much suffering and loss, the former beyond adequate description, and the latter beyond estimate. However, the business interests of Cincinnati were interrupted to a less extent than might have been expected under the circumstances, since the submerged portion of the city constitutes but a small percentage of its area.

At Portsmouth, Ohio, the water rose over the north end levee, completely flooding that section of the city, and the casualties incident to such situations were reported. The actual property loss amounted to about $125,000; but the outlay necessitated by the flood, and the value of the time lost by the business interests can not be estimated. The city of Maysville, Ky., suffered, perhaps, a greater proportionate loss than any other community. About one quarter of the city was submerged, business paralyzed, and railroad traffic suspended for several days. Heating appliances were flooded, the supply of gas cut off, and street car traffic discontinued. The highest stage of the water was 60.3 feet at 1 a. m. of the 21st. This was 5.4 feet less than the high-water stage of February 14, 1884, and 0.2 foot less than that of February 18 and 19, 1832.

Similar conditions, at times more or less aggravated, prevailed in the Louisville, Evansville, and Cairo districts. At Louisville the high-water stage of 41.4 feet on the 22d was 5.3 feet below the 1884 stage and the river was above the flood stage of 28 feet from the 17th to the 27th, inclusive. The property loss and damage amounted to between $400,000 and $500,000 and about 2000 acres, or one-seventh of the city's area, was under water. There was also much damage along the tributary streams in the State of Kentucky, and many towns and villages were cut off from the outside world.

Below Louisville the situation was rendered more serious by the fact that a flood of considerable proportions was still in progress when the great rise arrived from the upper river. It should have been stated before that this early flood in the lower river contributed much toward the prolongation of the flood crests in the upper Ohio.

At Evansville the river past the flood stage of 35 feet on the

4th and remained above until February 2, a period of thirty days. The maximum stage was 46.2 feet, on January 27 and 28. The actual damage in the district, including the Green River country, was surprisingly small, probably less than $200,000. The greatest loss was probably that of the corn in the bottom lands. There was, of course, the usual interruption of certain classes of business, and the expenses incident to the protection of property.

The crest stage of 50.3 feet was reached at Cairo on the 27th, and the river was above the flood stage of 45 feet from January 21 to February 5, a period of sixteen days. As over the upper river districts, the losses were not at all great, considering the duration and extent of the flood. Some corn, stock, fencing, and outbuildings were carried away, but not in great quantity. As a matter of fact, there was probably more damage done along the lower Wabash River, altho, as along the Ohio River, the warnings of the Weather Bureau had enabled the inhabitants to remove large quantities of property.

The town of Birdspoint, Mo., on the Mississippi River, immediately opposite the mouth of the Ohio, was almost completely inundated. The Cotton Belt Railway Company attempted to close a gap in the levee with sandbags, but the work was abandoned, and both the Cotton Belt and Iron Mountain railways were shut out from the town for eleven days; thousands of acres of land were overflowed and between 60,000 and 70,000 bushels of corn destroyed.

It is the opinion of Mr. P. H. Smyth, official in charge of the local office of the Weather Bureau at Cairo, that the sandbag work at Birdspoint increased the flood plane at Cairo a half foot, and possibly more. He is also of the opinion that the proposed new work at the same place will have a decided effect upon the future stages of the Ohio and Mississippi rivers in the vicinity of Cairo. The object of the work is to close a gap in the embankment thru which the flood waters now spread out over almost 100,000 acres of lowlands, and when the gap is closed the gage relations between Cairo and adjacent places are likely to be materially disturbed at high stages.

Station.	Forecast stage.	Actual stage.	Difference.
Pittsburg, Pa	23.5	23.2	−0.3
Wheeling, W. Va	36.0	36.9	+0.9
Parkersburg, W. Va	39.0 to 40.0	40.1	+0.1
Cincinnati, Ohio	65.0 or a little over.	65.2	0.0
Madison, Ind	56.5 to 57.0	56.7	0.0
Louisville, Ky	40.5 to 41.0	41.4	+0.4
Evansville, Ind	46.0	46.2	+0.2
Mount Vernon, Ind	48.5	48.5	0.0
Paducah, Ky	45.0 to 46.0	45.7	0.0
Cairo, Ill	50.0 to 50.6	50.4	0.0
Mount Carmel, Ill	24.0 to 25.0	24.5	0.0

The following table shows the dates between which the river remained above the flood stage, at various stations, together with the number of days. A special hydrograph of the Ohio River, showing the stages from day to day, will be found on Chart IX.

Above flood stage.

Station.	From—	To—	No. of days.
Pittsburg, Pa	January 20	January 20	1
Wheeling, W. Va	January 20	January 21	2
Parkersburg, W. Va	January 17	January 22	6
Point Pleasant, W. Va	January 16	January 24	9
Huntington, W. Va	January 17	January 23	7
Catlettsburg, Ky	January 17	January 24	8
Portsmouth, Ohio	January 17	January 25	9
Maysville, Ky	January 17	January 25	9
Cincinnati, Ohio	January 16	January 26	11
Madison, Ind	January 17	January 26	10
Louisville, Ky	January 17	January 27	11
Evansville, Ind	January 4	February 2	30
Mount Vernon, Ind	January 5	February 4	31
Paducah, Ky	January 21	February 5	16
Cairo, Ill	January 21	February 5	16

The warnings of the Weather Bureau during the entire flood were issued as far in advance as the varying conditions and circumstances would permit. That they were accurate in practically every particular is evidenced by the very small losses as compared with those resulting from the great floods of previous years. In the preceding tables will be found the forecast and the actual crest stages, and the differences between them at the various stations.

General floods also occurred over the interior rivers of Ohio from the 4th to the 6th, and from the 19th to the 23d, all inclusive, for which warnings were issued at the proper time. The warnings proved to be very effective, and no serious damage was reported.

The lower Tennessee flood of the first week of the month did no material damage. Warnings were issued on the 2d, 3d, and 4th, and a stage of 24 feet forecast for Johnsonville, Tenn. On the morning of the 6th the stage of the river at that place was 24.1 feet. The warnings were of great benefit to the lumber and farming interests.

There was a severe flood and ice gorge in the Grand River of Michigan caused by the warm and heavy rains of the 19th and 20th, and the cold wave of the 21st. To the rains was added the water from about two and one-half inches of snow that was melted and carried into the river. A large ice gorge formed at the village of Portland, Mich., raising the water above the flood stage of 12 feet during the night of January 21 and 22. While the jam checked the rise in the lower river, it created a serious situation that was soon recognized, and on the morning of the 23d general warnings for high water were issued from the local office of the Weather Bureau at Grand Rapids. At 11 a. m. of the 24th the river at Grand Rapids stood at 18.5 feet, 7.5 feet above the flood stage and 1.9 feet below the high-water stage of March 26–27, 1904.

After this time the river began to fall slowly, but at the end of the month it was still one foot above the flood stage, with several ice gorges still intact. Special bulletins and advices were issued frequently until the water subsided, and the work of the Weather Bureau was commended in the highest terms, both officially and otherwise. The conditions were about as severe as any that have been experienced in recent years, and the work of forecasting was attended by numerous difficulties. At Portland all of the factories were compelled to close, and large portions of the business and residential districts were rendered untenantable. At Grand Rapids nearly one hundred factories were closed down, throwing out of employment over six thousand men. Basements were flooded with from two to five feet of water, fires were extinguished, elevators stopt, and business generally inconvenienced. The warnings, however, altho given on comparatively short notice, were effective in saving nearly all property capable of removal or protection.

There was some danger of a flood in the Hudson River in the vicinity of Troy and Albany on account of an ice gorge near Stuyvesant, N. Y., and preliminary warnings to this effect were issued on the 3d. The breaking of the ice relieved the situation after the river had past the flood stage at Troy, and nearly reached it at Albany. High water also did some damage in portions of the Mohawk Valley.

There were two floods in the Illinois River. The first was a moderate one for which warnings were issued from the 8th to the 11th, inclusive. While the crest stages were above the flood limits, no damage of consequence was done. The second flood was caused by the heavy rains about the middle of the month, and warnings were issued on the 19th, 20th, and 21st for stages several feet above the flood limit. Stages as follows were recorded: La Salle, Ill., 28.6 feet, 10.6 feet above flood stage; Peoria, Ill., 20.4 feet, 6.4 feet above flood stage, and Beardstown, Ill., 18.3 feet, 6.3 feet above the flood stage.

At La Salle the flood was the most disastrous for many years, and the worst ever known at this season of the year. Many buildings were flooded, and much damage done. The pontoon bridge at Lacon, Ill., 25 miles above Peoria, was car-

ried away, and along the lower river there was considerable damage to bridges, farm lands, and railroad property.

Heavy rains on the 18th caused a marked rise in the Neosho River. The rise came very rapidly, but it was nevertheless possible to issue warnings for flood stages at Oswego, Kan., by January 20, and for continued high water at Iola, Kans. Stages of 13.4 feet and 21.0 feet were reached at Iola and Oswego, 3.4 and 1.0 feet, respectively, above flood stages. No damage of great consequence was reported, altho the smaller streams overflowed their banks in many places.

Flood stages also occurred in the White River of Arkansas. There were two floods in the upper river, and one in the lower. Warnings were issued on the 3d and 10th, and no damage was done along the upper river. At Clarendon, Ark., the river remained above the flood stage of 30 feet from the 5th to the 26th, inclusive, with a crest stage of 32.5 feet from the 9th to the 11th, inclusive, but the only loss reported was that of about two hundred head of cattle and some hogs in the bottoms near Clarendon.

The Willamette River flood from the 4th to the 6th, inclusive, was checked by cold weather, resulting in stages somewhat lower than had been at first anticipated, and, at the same time, reducing the damage to a minimum. The flood was caused by the heavy rains from the 2d to the 4th, inclusive, falling upon an already saturated watershed, and the outlook was very serious until the arrival of the cold weather. As it was, flood stages were exceeded, except along the extreme lower reaches, but not to the extent that had at first been indicated.

At the end of the month the Missouri River was practically frozen as far south as Omaha, and the ice was 11 inches in thickness at Sioux City, Iowa. The Mississippi River was frozen to Leclaire, Iowa. Floating ice reached to only a short distance below Cairo.

The New England rivers remained generally frozen, while the Lehigh and upper Delaware were closed for a portion of the month.

The highest and lowest water, mean stage, and monthly range at 291 river stations are given in Table VI. Hydrographs for typical points on seven principal rivers are shown on Chart I. The stations selected for charting are Keokuk, St. Louis, Memphis, Vicksburg, and New Orleans, on the Mississippi; Cincinnati and Cairo, on the Ohio; Nashville, on the Cumberland; Johnsonville, on the Tennessee; Kansas City, on the Missouri; Little Rock, on the Arkansas; and Shreveport, on the Red.—*H. C. Frankenfield, Professor of Meteorology.*

SPECIAL ARTICLES, NOTES, AND EXTRACTS.

THE KINGSTON EARTHQUAKE.

By Prof. C. F. MARVIN. Dated January 22, 1907.

The following bulletin, prepared at the Weather Bureau, was given to the press associations on the afternoon of Tuesday, January 15, 1907, at a time when, according to the earliest dispatches, a great earthquake was supposed to have occurred at Kingston on that day; whereas it will be noted that the record referred to in this bulletin relates to Monday, January 14. It finally turned out that the earthquake had actually occurred twenty-four hours before news of it reached the United States, owing to the complete interruption of telegraph and cable communications.

The seismographs at the Weather Bureau recorded a distant earthquake, of moderate intensity, on the afternoon of January 14, 1907, beginning at 3 hours 38 minutes 23 seconds p. m., seventy-fifth meridian time, or 8 hours 38 minutes 23 seconds, Greenwich meridian. The relatively stronger portion of the motion was greatest in the east-west component and lasted from 3:45 p. m. until 3:52 p. m.

The maximum amplitude of motion in the east-west direction was only about one-fiftieth of an inch.

The earthquake recorded as above is undoubtedly the same as one that is reported to have occurred in the island of Jamaica at the same date and hour. The press reports are as yet very indefinite as to the time when the earthquake occurred at Kingston. By the use of well-known seismological formulas we may deduce, from the records made at Washington, that at its origin this earthquake began at 3 hours 33 minutes 9 seconds, p. m., seventy-fifth meridian time, January 14.

Judging from the magnitude of the motion as recorded at Washington we regard the present disturbance as of slight intensity when compared with other recent great earthquakes, such as those at San Francisco and Valparaiso, and that in the Indian Ocean on October 1, 1906. This is especially true in view of the fact that the distance of Kingston from Washington is only about 1420 miles, while San Francisco is distant 2435 miles, and Valparaiso 4900 miles, or nearly three and a half times as far as Kingston, and both Kingston and Valparaiso are almost exactly south of Washington. The amplitude of the motion at Washington, in the present case, is distinctly less than in either of these other great earthquakes, and we may therefore conclude that the violence of the "Kingston earthquake" was also less at its origin.

Attention is called to an interesting feature in these earthquake records, which confirm, in a noticeable degree, certain theories that have been advanced in regard to the different kinds of wave motion that occur during an earthquake. Kingston and Washington are very nearly on the same geographical meridian, Kingston being only 15 minutes of arc east of Washington, at a distance of something over 1400 miles. In other words the direct line of propagation was, in this case, exactly from south to north. The two seismograph pendulums at Washington are so placed as to record north-south and east-west components, respectively.

The details of the several phases characteristic of records of distant earthquakes are given in the following table:

Kingston earthquake, afternoon of January 14, 1907, seventy-fifth meridian time.

TIME OF EARTHQUAKE.

	N.-S. component.	E.-W. component.
	h. m. s.	*h. m. s.*
First preliminary tremors began January 14, 1907, at	3 38 23	Absent.
Second preliminary tremors began at	3 42 50	3 42 50
Principal portion began at	3 46 45	3 46 38
Principal portion ended at	3 55 03	3 55 03
End of earthquake at	4 40 23	4 49 23

DURATION OF PHASES.

	N.-S. component.	E.-W. component.
	h. m. s.	*h. m. s.*
Duration of first preliminary tremors	0 04 27	Absent.
Duration of second preliminary tremors	0 03 55	0 03 48
Duration of principal portion	0 08 18	0 08 25
Total duration of earthquake	1 02 00	1 06 33
Period of pendulum	20 secs.	20 secs.
Magnification of record	25 times.	20 times.
Maximum double amplitude of actual displacement of the earth at the seismograph	*mm.*	*mm.*
Amount	0.11	0.55
Time	$3^h\ 54^m$	$3^h\ 50^m$ – $3^h\ 51^m$

NOTES.—*North-south component:* The period of the waves in the first portion of the "principal portion" was about 10 seconds, with very small amplitude, followed by complex waves of small amplitude beginning at 3:50:23 p. m., of 17-second periods; again followed by waves of shorter period and small amplitude.

East-west component: The first preliminary tremors appear to be absent. The second preliminary tremors are very faint, but appear to begin simultaneously with the second preliminary tremors in the north-south component. The periods in the principal portion are about 10 seconds at first; then complex and long, 20 to 30 seconds; then, from 3:48 to 3:50 p. m., large and regular, at about 20-second periods, ending with maximum waves of 10- to 12-second periods.

Now the record of the "first preliminary tremor" in the north-south direction began at Washington at 3 hours, 38 minutes, 23 seconds, followed by the "second preliminary tremors" 4 minutes and 27 seconds later; the "principal portion", or large motions, began about eight and a half minutes later than the beginning of the "first preliminary tremors". During all this period of eight and a half minutes during which motions were distinctly recorded in the north-south direction, there was an almost total absence of "preliminary tremors" in the east-west direction. Nevertheless, the "principal portion" of the earthquake record at Washington began very abruptly in the east-west component at practically the same instant of time that it began in the north-south component. In addition to this, the amplitude of the east-west motion averaged about five times greater than that of the north-south component.

These results are entirely explained if we assume that the "preliminary tremors", especially the early portions, are longitudinal or compressional waves only; that is the motions of the ground take place directly in the line of propagation, which, in this case, was almost exactly north and south, and therefore affected only the pendulum that records the north-south component, but not the east-west component. Furthermore, the relatively great magnitude of the east-west vibrations appears to be explained on the assumption that in general the stronger motions of the earthquake are surface vibrations transverse to the direction of propagation; in the present case these stronger transverse vibrations were in a strictly east-west direction.

Theories have already been put forth classifying the vibrations of earthquake motions in accordance with the foregoing ideas, but the writer is not aware that a real earthquake of considerable magnitude has ever been actually recorded at stations so favorably located as Kingston and Washington to bring out a full confirmation of the theory.

At this time (January 22) we do not know whether the records of the two seismographs at Cheltenham (a little east of Washington) show such peculiarities as to allow of similar deductions.

THE GEODETIC INSTITUTE AT POTSDAM.

The activity of the Royal Geodetic Institute at Potsdam and of the International Institute which has its center there, covers many items in which meteorologists are interested, such as the size and shape of the earth, the orography of its surface, and the variations in gravity and latitude all of which are closely related to the dynamics of the atmosphere. The annual report of the institute for the year ending April, 1906, submitted by Prof. Dr. Robert Helmert, mentions the following, among other items.

(1) An appreciative notice of the admirable map of Japan made between 1800 and 1818 by T. Ino, a learned Japanese, who knew nothing of European languages and probably very little of European methods. Up to his fiftieth year he was employed as a brewer. He then devoted six years to the study of astronomy, and in his fifty-sixth year undertook this great geodetic work, which he finished after eighteen years of steady labor. A comparison with modern work shows that his geographic latitudes, determined with the crudest instruments, are accurate to within one minute of arc.

(2) The determination of the intensity of gravity at numerous stations in Europe, and especially the absolute determination at Potsdam has occupied a very large amount of attention.

(3) The international latitude service has progressed steadily since 1900, and six continuous years of work are now available for determining the irregular motions of the axis about which the earth rotates, which motions, according to some authorities, are largely the result of meteorological processes. Five stations in the Northern Hemisphere and two in the Southern Hemisphere are now maintained by the International Geodetic Association, and several other stations have voluntarily undertaken such work at their own expense. This work involves the determination of the latitude on every clear night continuously for several years, and the accuracy of the work must be such that a change of five feet in latitude shall be detected. Therefore this latitude work will determine in absolute measures those changes on the earth's surface for which the seismograph gives only relative measures.

(4) By comparing atmospheric pressures measured by mercurial barometers with pressures determined by means of the thermometric boiling point apparatus we are able to determine the force of gravity; and this method, which at first appeared crude, has been brought to such perfection by the labors of the Geodetic Institute that it promises to give us some idea of the variations of gravity over the surface of the ocean, for which hitherto we have had no determinations whatever. The observations made over the Indian and Pacific oceans are now in the course of computation. Whatever the outcome of this particular work may be there is no doubt but that it has already led to very great improvements in methods of determining the boiling point, and has stimulated the more accurate determination of vapor pressures at different temperatures.[1]

(5) The levelings of high precision, together with the determination of the average sea-level surface serving as the basis for all accurate hypsometry, are in the hands of the Geodetic Institute, whose work in this line rivals in importance that of the United States Coast and Geodetic Survey.

(6) The relative movements of the earth's crust, as shown by observations of a horizontal pendulum, have been recorded continuously since January, 1904, in an underground chamber, about eighty feet below the ground, near the buildings of the Geodetic Institute, at Potsdam.

(7) As to seismology, proper, the astatic pendulum of Wiechert and the horizontal pendulum in the special earthquake observatory at Potsdam have been kept in continuous action.

(8) In the special report of Professor Doctor Hecker on earthquake observations he states that the tremors of the earth recorded during the years 1904 and 1905 have been submitted to an investigation with reference to their possible connection with some meteorological factor, and it is found that the amplitudes of those movements of the soil that have a period of about thirty seconds of time run parallel to the strength of the wind.[2] Professor Doctor Hecker also adds that the records of previous earthquakes have been examined to ascertain whether any movement of the soil could be detected as the effect of an earthquake wave reaching the station not by the shortest route from the earthquake center but by the longest route around the earth. He states that in many cases this has been possible, and thus the progressive velocities of the earthquake waves have been more accurately determined.

(9) The accuracy with which time was kept by the Riefler normal clock, with nickel-steel pendulum, in an inclosure at constant pressure, is shown by the table published by Doctor Wanach, from which it appears that a change of 1° C. in

[1] The new edition of Landolt and Börnstein's Tables, Berlin, 1905, gives us, in Tables 57-60 for the first time, the vapor tensions over ice from —50° to 0° C., the tension over water from —20 to 0° C., and the tension over water from 0° to 100° C., corrected for various sources of error and reduced uniformly to the international hydrogen thermometer scale, instead of the normal mercurial thermometer scale used by Reaumur. The tensions below 0° C. are those of Marvin and Juhlin.—Ed.

[2] Observations in Washington show that the pressure of the wind against the walls of the building alters the distribution of the pressure within the soil so as to affect the piers upon which the seismograph is placed. As the movements of the pier are magnified from ten to a hundred times, depending upon the adjustments of the seismograph, these movements due to the wind can generally be easily distinguished from those due to an earthquake, but periodic movements of soil, pier, and pendulum are inextricably confused together.

temperature affected the daily rate by only three thousandths of a second of time, and the average daily rate of the clock during the whole year varied between 0 and two-tenths of a second. Such accuracy as this greatly facilitates the determination of the force of gravity by the pendulum method, and is an essential condition in many other branches of work.

The determination of the absolute value of the force of gravity at Potsdam by means of the reversion pendulum has been published as No. 27 of the memoirs of the Royal Prussian Geodetic Institute. This extensive work is by Prof. Dr. F. Kuehnen and Prof. Dr. P. Furtwaengler, and has been in progress since 1898. On account of the fundamental importance of the determination of the force of gravity in order to ascertain the exact shape of the earth this problem is considered one of the most important problems in geodesy, and indeed it is but little less important for all branches of terrestrial and molecular physics, and even astronomy itself; all measurements of pressure, weight, volume, density of gases and vapors made on the earth's surface are subject to any irregularity that may take place in the force of gravity. In accordance with a general principle in all exact work, that measurements must be repeated with different instruments, and under different conditions, by different persons, and at different times, in order to detect the influence of every possible source of error, these observations have been conducted under various intentional modifications of method and apparatus. The fundamental variation has been in the manner of supporting the pendulum, so that the work divides itself into two parts: (*a*) pendulum supported by a knife-edge, resting upon a horizontal plane; (*b*) pendulum supported by a plane resting upon a fixed knife-edge. The swings were made at different temperatures and pressures, and with different amplitudes of oscillation; and the reductions to standard pressure and standard temperature were accurately determined. The influence of the elastic bending of the material, and especially of the induced oscillations in the support of the pendulum demanded a long investigation. The general result of this elaborate memoir is exprest in a few words. In the pendulum room of the geodetic hall at Potsdam, latitude 52° 22.86′ north, longitude 13° 4.06′ east from Greenwich, 87 meters above sea level, the length of the simple seconds pendulum is 994.239 ± 0.003 millimeters; or the acceleration of gravity is 981.274 ± 0.003 centimeters per second per second; or a heavy body falling freely in vacuo will fall 490.637 centimeters during the first second.

PERMANENCE OF CLIMATIC CONDITIONS.

[Extract from letter of Mr. ETHAN ALLEN to the Chief of Bureau. Dated Perry, Okla., January 22, 1907.]

Observation has shown me that the weather conditions do not change; taking a number of years, say twelve, and making an average the rainfall will not vary more than an inch or two in any one period over any other. It is true that in some years the precipitation is slightly more than in others; during some years the rainfall is better distributed than others; but take any period and the rainfall is about the same. After all is said the fact remains that this is a dry country, and there are natural causes why this is so and why it will remain so.

We read in the Old Testament that Abraham, Isaac, and Jacob, old cowmen of their day, living in a dry country, were fighting over water rights; and the fact is the people living in the same country in which they lived are to-day disputing over the water necessary to support their stock. It was dry then, it is dry now, after all these years of settlers; and in a thousand or two thousand years there will not be any more rainfall in the "Panhandle" than there is now. Anyone that expects anything different will be disappointed.

While there is no change in the rainfall there is a change in the people, and the people have learned better how to farm arid lands, how to plant crops better adapted to droughty conditions, how to utilize the moisture that does fall—until some confound the change in treating the soil with a change in climatic conditions.

All the dry land east of the mountains will ultimately be utilized, with the rainfall that naturally comes, but it will be by adapting conditions to the rainfall—never by changing the rainfall, for that is impossible.

IS NOT HONESTY THE WISEST POLICY?

A significant article in the Independent of January 31 narrates the trials of an honest independent thinker, who at the end of a long life is only able to say: "I am a slave to my committee, and always have been;" and again: "I like to recall the intellectual, as well as spiritual, independence of my grandfather, but that was fifty years ago. * * * Men are no longer measured by spirituality, or by intellectual achievements. * * * It is a miserable fact, which we must honestly face, that the average man is hypnotized out of his independence and manhood by the rich man of his environment. * * * The time has come when he who wishes to be successful must be financially independent of his salary".

All this may be true of the ministerial, educational, and some other professions, but it ought not to be true of the scientific man, and least of all of the meteorologist; and yet we are told that the frosts and freezes in one State, droughts and rains in another, earthquakes in still another, the tornadoes of some regions and the hurricanes of others, are matters about which "mum is the word"; that Weather Bureau men must not publish honest reports on these subjects because of the injury to local business enterprises and land booms, and that when they do make honest reports they must suffer attacks from those who wish to suppress the truth.

This ought not to be. If a few persons are injured by some unexpected natural phenomenon, be it earthquake, storm, frost, flood, drought, or stroke of lightning, the rest of the world is interested to know that fact; for it enables us all to be on the lookout for similar occurrences. Forewarned is forearmed, and it is the highest duty of the Weather Bureau to care for the best interests of the whole community. We are supported by the whole nation and owe to it our best service. An active business man may be justified in booming his own business and the financial interests of his clients, but he protects only a small part of the community; and the law does not allow even him, in helping his own friends, to work any injury to others. The weather, the mineral, agricultural and forest conditions, and the health of the community are among those matters of universal interest about which the whole truth should be known as nearly as we can get at it. Every patriotic citizen must rebel at the idea that a government for the people and by the people shall not be permitted to publish an honest report of data gathered by its own official observers for the use of all the people.

It is wrong to mutilate or suppress the record of an observation of a phenomenon of nature, but it is also wrong to make a bad use of the record. In fact, it is the misuse of meteorological data, not the observing or publishing, that constitutes a crime against the community. Observation and careful research are to be encouraged as useful. Misrepresentations are to be avoided as harmful. The "Independent Press" as the "Voice of the People" should be not only "Vox Populi" but "Vox Dei", repressing all cheats and hoaxes, defending the truth and the best interests of the whole nation as against the self-interest of a few.—*C. A.*

THE ADIRONDACK RAINFALL SUMMIT.

By ROBERT E. HORTON. Dated Albany, N. Y., December 21, 1906.

Rainfall maps of New York have been prepared by Turner (1894), Rafter (1898), and Kuichling (1900). The latter two are on a large scale and embody the means of a large number of records. In preparing these maps no effort was made to reduce the records to a uniform epoch, and even on the assumption that the average of each record for whatever period it covered was the true mean for the station, the data were found to be too meager to permit of any definite conclusion as to the distribution of rainfall over the Adirondack plateau.

Between 1900 and 1906 a greatly increased number of records have been kept in New York. Believing that a rainfall map of this region plotted from entirely synchronous records would at least show the relative rainfall distribution for the base[1] period covered, the writer compiled the records for twenty-five stations and computed the means for the pentad 1901-1905. The results are stated in Table 1 and are shown on the accompanying map (fig. 1). In a few cases incomplete records have been filled out from adjoining stations. In case of the record at Number Four eight months were missing and in case of North Lake the record from 1902 to 1905 was wanting. These have been filled out by Fournie's method,[2] using as base records in each case three well-authenticated stations so situated as to form the vertices of a triangle surrounding the station to which the method is applied. In each case base records have been chosen which run parallel with the record to be extended during five years. Special care has been taken in this extrapolation because the location of the 50-inch and 55-inch isohyetals depends chiefly on the Number Four and North Lake records.

TABLE 1.—*Comparative precipitation at stations on the Adirondack plateau, 1901-1905.*

Station.	Altitude.	1901.	1902.	1903.	1904.	1905.	Mean.
	Feet.	*Inches.*	*Inches.*	*Inches.*	*Inches.*	*Inches.*	*Inches.*
Adams Center	597	57.17	51.24	47.83	59.07	54.44	53.95
De Kalb Junction	440	43.75	31.86	37.09	34.11	36.02	36.56
Blue Mountain Lake	1,771	45.25	48.65	49.34	45.01	56.58	48.96
Deerfield	700	42.56	54.50	49.76	45.94	51.98	48.95
Glens Falls	340	35.10	42.71	43.31	36.39	37.35	38.97
Gloversville	850	36.46	46.88	49.16	42.88	49.29	44.93
Indian Lake	1,705	37.99	47.88	43.36	36.01	40.10	41 07
Keene Valley	1,000	42.60	48.62	41.23	29.86	41.45	40.75
Little Falls No. 2	1,526	45.09	47.11	46.29	50.61	55.21	48.84
Little Falls No. 1	924	36.62	43.81	44.52	36.25	46.62	41.56
Lowville	900	45.38	45.96	48.61	36.65	44.86	44.29
Lake George	330	42.35	49.38	47.83	41.15	39.82	44.11
Moira	800	49.35	35.26	36.45[a]	34.68	43.44	39.83
Number Four	1,571	55.18	60.41	64.72	53.70	58.60	58.52
North Lake	1,822	56.45	63.68	60.71[b]	51.06[b]	62.42[b]	58.86
Ogdensburg	258	34.07	24.15	37.60	27.91	29.68	30.68
Plattsburg	125	34.87	36.66	28.90	35.30[a]	36.08	34.36
Rome	445	44.45	49.34	47.77	48.82	52.24[c]	48.52
Saranac Lake	1,750	35.41	35.93	36.13	30.90	44.30	36.53
South Scroon	1,225	40.24	48.79	45.96	36.25	45.60	43.37
Saratoga	316	38.84	44.71	48.74	42.12	41.75	43.23
Ticonderoga	128	32.79	34.76	35.09	25.46	31.23	31.87
Utica Reservoir	700	47.00	52.36	50.37	44.40	59.59	50.74
Watertown	486	44.70	37.24	40.91	40.48	44.80	41.63
Wells	850	49.61	53.09	43.85	45.32	47.94	47.96

[a] Chazy. [b] Fournie's method. [c] 1900.

[1] This is the "fundamental period" of some authors.—EDITOR.

[2] V. Fournie, engineer of roads and bridges, France, is said to have been the first to formulate, in 1864, a method of interpolating isolated months so as to obtain complete years of rainfall and a method of interpolating isolated years so as to obtain homogeneous rainfall data for a given "fundamental period". (See Angot on the rainfall of the Iberian Peninsula, in the Annals of the Central Meteorological Bureau, Paris, 1893, quoted at length in the Monthly Weather Review, April, 1902, page 238.) Mr. Horton gives the following as an example of the application of Fournie's method:

"In order to complete the North Lake record 1896-1902 for the period 1901-1905, I chose as base stations Gloversville, Number Four, and Utica Reservoir (1897 to 1905). I computed the ratio of the mean rainfall at each of these stations for the period of 1897 to 1901 to that at North Lake for the same period, and then multiplied the measured rainfall at each base station for each year, 1902 to 1905, by the corresponding ratio, and used the average of the three results as the rainfall for North Lake for the corresponding year".

Every study of climatological data must be preceded by careful reduction to a fundamental period if we would avoid erroneous conclusions.—EDITOR.

Certain additional records which do not cover any portion of the period 1901 to 1905 have been included. Using the best available base records the proportional rainfall at these stations for the period here considered has been deduced as shown in Table 2.

TABLE 2.—*Earlier precipitation records and estimated precipitation for base period.*

Station.	Altitude.	Period.	Mean.	Estimated mean, 1901-1905.
	Feet.	*Years.*	*Inches.*	*Inches.*
Houseville	900	1867-69	48.22	54.60
Turin	1,240	1890-95	52.92	56.69
Constableville	1,246	1889-93	55.04	50.98
South Trenton	825	1863-76	52.51	63.41

The southwestern Adirondack rainfall summit is the most striking feature of the map (fig. 1). It has been figured on earlier maps and the main object of the present study has been to confirm and account for it. The rainfall stations at Number Four and North Lake have been inspected, the former by the writer, the latter by an assistant. The exposures are favorable and the records have apparently been intelligently and accurately kept. The record at North Lake is confirmed by two short records the results of which are given in Table 3.

TABLE 3.—*Comparative precipitation, in inches, at North Lake and neighboring stations.*

Month.	1900.			1901.		1906.		
	North Lake.	Honnedaga.	Bisby Lodge.	North Lake.	Honnedaga.	North Lake.	Honnedaga.	Hoffmeister.
January	......	......	......	......	......	5.30	......	2.90
February	......	......	......	5.08	2.50	......	2.53	4.24
March	......	......	......	3.04	3.89	2.62	......	5.57
April	......	......	......	3.40	1.65	2.17	2.09	3.70
May	......	......	......	5.57	6.80	7.21	5.22	5.55
June	2.59	3.94	4.90	8.06	5.81	......	5.24	5.58
July	4.94	5.56	4.18	6.34	7.37	4.84	2.99	4.35
August	5.28	5.54	7.41	3.86	5.23	3.15	4.24	4.76
September	2.60	3.36	3.67	3.59	1.42	3.30	4.89	3.69
October	3.25	3.39[a]	3.39	......	......	......	......	......
November	7.56	7.21	8.55	......	......	......	......	......
December	2.09	4.66	3.19	......	......	......	......	......
Total	28.31	33.66	35.29	38.94	34.67	......	......	......

[a] Bisby Lodge.

Topographic contours at 1000-foot intervals have been sketched on the map, also the principal watershed lines. The most elevated regions receive about forty inches precipitation. It should be noted, however, that there are no extensive areas in the Adirondacks lying above elevation 3000 feet; the valleys and lakes at the headwaters of the streams lie in most cases below elevation 2000. The 3000 and 4000-foot contours have been drawn to include areas in which most of the mountain masses are above these elevations and the included area has been cross-hatched. There are, however, many peaks outside this area which project above 3000 feet.

In fig. 2 is shown a profile along parallel 43° 30′ north extending eastward from Lake Ontario on a line running a few miles south of North Lake. This shows an ascent from the elevation of the lake, 247 feet, to elevation 1600 feet in the first forty miles, crossing what is known as Tuigg's Hill. Black River Valley is then crost at elevation 1000 feet, after which the Adirondacks are entered. The elevation in the region of maximum rainfall varies from 2000 to 2500 feet. F. Pockels has calculated the height in meters that a current of air must be uplifted by a mountain slope in order to produce rain by dynamic cooling. The results reduced to feet are given in Table 4, which shows the height to which a mass of air must be raised above H_1 to produce condensation. The table is based on average temperature and moisture gradients deduced

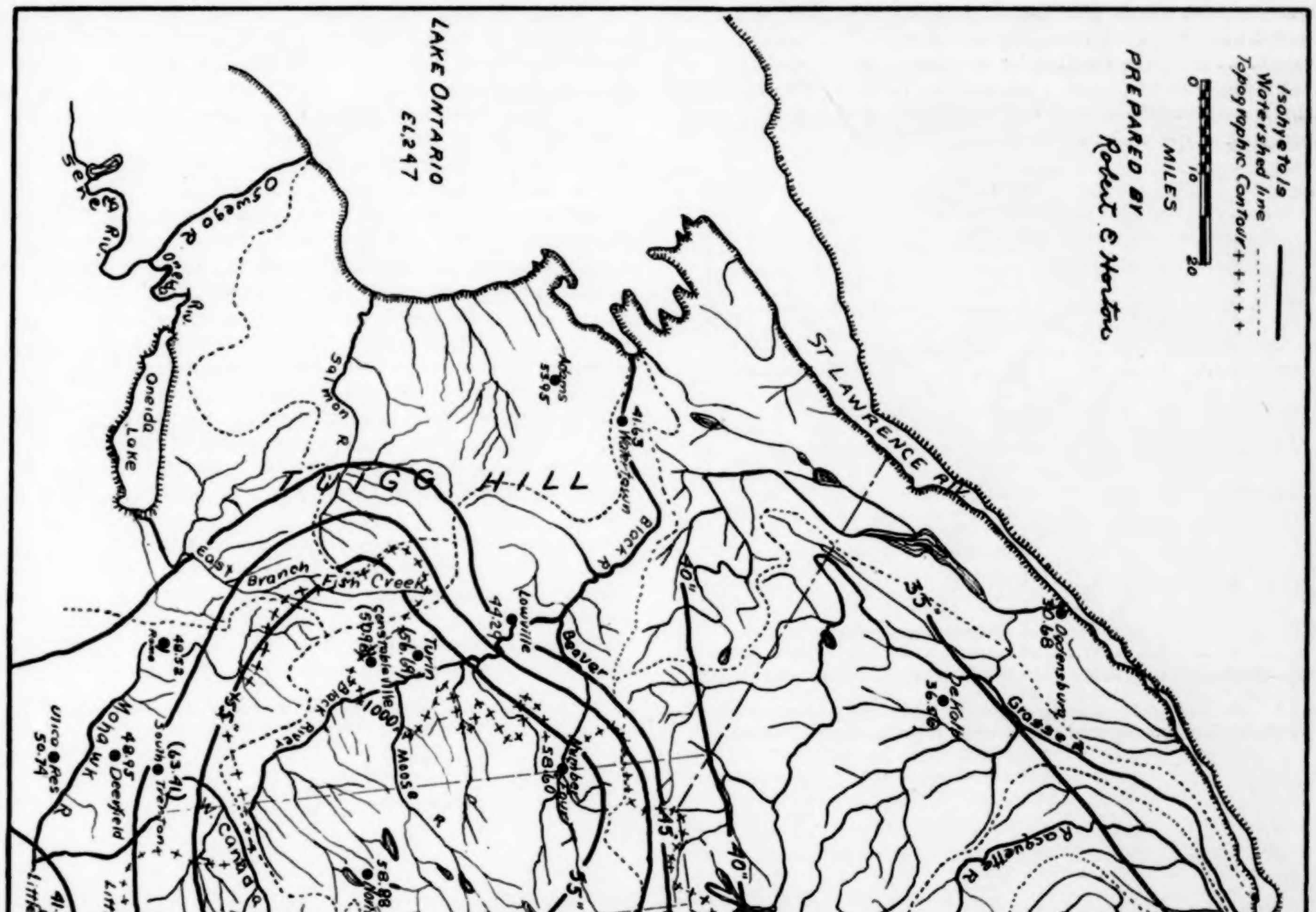

FIG. 1.—Adirondack rainfall, drainage basins and topography.

from balloon ascensions. For the moisture-laden prevailing west-southwest winds blowing off Lake Ontario and ascending the southwest slope of the Adirondacks, the tendency to condensation would presumably be greater. With moisture and temperature conditions as assumed in Table 4, the elevations at which condensation will be produced on the southwestern Adirondack slope will be about as follows:

	Feet.		Feet.
Spring	2,507	Summer	2,966
Autumn	1,678	Winter	1,736

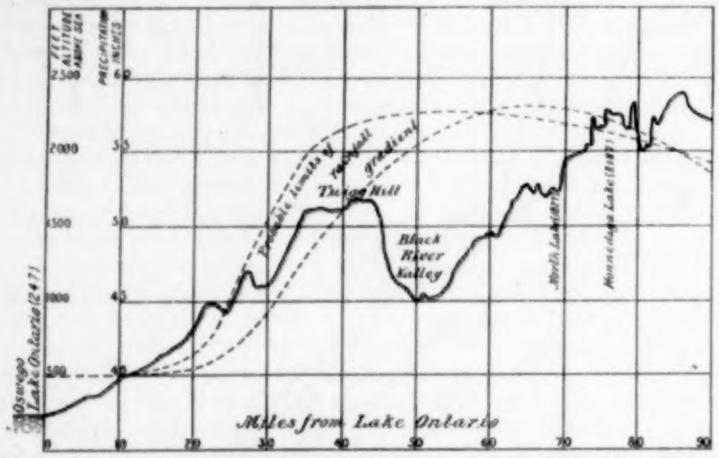

FIG. 2.—Profile along parallel 43° 30′ N. from Lake Ontario eastward.

TABLE 4.—*Pockels's table showing minimum height that a mass of air originally at elevation H_1 must rise in order to produce condensation.*[3]

H_1 (feet).	Height in feet above H_1 when condensation begins.			
	Spring.	Summer.	Autumn.	Winter.
0	2,378	2,788	1,328	1,312
1,640	1,891	2,329	2,017	2,493
3,280	2,804	1,870	1,968	3,510
4,920	2,919	2,230	2,738	3,739
6,560	3,018	2,394	3,870	3,608
9,840	2,722	3,477	3,969	3,706
13,120	2,296	3,690	4,067	3,608

Bearing in mind the nearness to Lake Ontario and the excessive snowfall experienced on Tuigg's Hill and in Black River Valley it appears probable that Tuigg's Hill is a sufficient barrier to produce a large increase in precipitation in winter. The fact that the precipitation decreases easterly from North Lake, altho the altitude northeast of the rainfall summit increases rapidly, indicates that in this case the southwest slope has sufficient elevation to relieve the southwest winds of most of their available moisture.

In the Adirondacks we have then, first, a rapid increase of precipitation with altitude over the southwest slope; then a rapid decrease of precipitation as the altitude increases proceeding northeast. In this decrease of rainfall, however, the orography probably plays no part whatever. This matter of relation of orography to rainfall has been much discust, and the apparent negative results in cases similar to the above have been assumed to disprove the existence of any definite law of relation. In the writer's mind the conditions forcibly illustrate the fundamental principal of oro-dynamic condensation, it being apparent that, given a moisture-laden wind blowing over a sufficient slope, increased precipitation must result. Certain orographic and meteorological conditions must, however, be present. If suitable meteorological conditions are not present, obviously there will be no increase of precipitation adjacent to mountains.

The area having over fifty inches rainfall includes a large portion of Black River drainage basin, the principal tributaries being Moose and Beaver rivers. It also includes the headwaters of Salmon River, east branch of Fish Creek, Mohawk River, and East and West Canada creeks. All of these streams have been gaged. In the absence of adequate records in the rainfall summit region a number of attempts have been made to deduce the precipitation for these drainage basins by combining the nearest adjacent precipitation records.

The discrepancy between such estimates of rainfall or of run-off based thereon, and the measured stream flow, forcibly illustrates the folly of too close adherence to numerical data in such studies, and also illustrates the necessity for rain gages at the higher altitudes. An estimate of the rainfall in the region here considered based on the records at surrounding stations would bear about the same relation to the truth as an estimate of the height of a mountain based on the average elevation of points around its base.

The comparative run-off during the summer season of streams having their headwaters in the Adirondack region is shown in Table 5. The first three streams named in the table have their headwaters in or drain a portion of the rainfall summit region.

Saranac River, Lake George outlet, and Hudson River drain much of the eastern Adirondack slope. The run-off of the Hudson River is subject to artificial control and to diversion above the point of gaging during the summer period. Its total yearly run-off during the period 1901 to 1905 has averaged about twenty-seven inches.

TABLE 5.—*Comparative annual depth of run-off, in inches, for streams having their headwaters in the Adirondack region.*

Stream.	Gaging station.	Area above gaging station.	1901.	1902.	1903.	1904.	1905.	Mean.
		Sq. miles.	*Ins.*	*Ins.*	*Ins.*	*Ins.*	*Ins.*	*Ins.*
East Canada Creek	Dodgeville	256	29.16	32.58	44.07	34.02	37.57	35.48
West Canada Creek	Twin Rock	364	40.50	53.22	55.75	44.39	50.87	48.95
Oneida River	Oak Orchard	1313	......	......	37.49	32.50	33.16	34.38
Seneca River	Baldwinsville	3103	......	......	17.92	17.42	15.19	16.84
Oswego River	Battle Island	4990	......	......	22.06	24.31	21.81	22.72
Weighted mean of the Oneida and Seneca rivers		4416	......	......	......	......	......	22.28
Precipitation at Number Four		......	55.18	60.41	64.72	53.70	58.61	......

The geology and topography do not differ materially and the influence of forest cover is apparently about the same for the eastern as for the western portion of the Adirondack region. The excess in summer run-off for the southwestern as compared with the eastern Adirondack slope is clearly shown by comparing the run-off of Saranac River (13.86 inches) and Lake George outlet (11.71 inches) with the other streams in 1905. The average run-off for the two regions bears the ratio 12.78 : 22.28. As further confirmation of the heavy run-off from the southwest Adirondack slope, we may compare the gaging records of the Oneida and Seneca rivers, which unite to form the Oswego.

As above stated, a part of the Oneida basin lies in the region of maximum precipitation, for which, however, records are mostly wanting. Seneca River drains the Finger Lake region of central New York. The average precipitation on this basin is about thirty-five inches and is well determined.

The total measured outflow from the Oneida and Seneca basins is 7266 cubic feet per second. Taking such a proportion of the Oswego flow as its drainage area bears to the combined drainage areas above the other two gaging stations, we obtain 7273 cubic feet per second. This confirms the gaging records.

The depth of the run-off from the Oneida basin is more than double that from the Seneca basin. The aggregate volume of water draining from the Oneida basin is also nearly as great

[3] Monthly Weather Review, July, 1901, Vol. XXIX, p. 306. The figures are there given in meters.

as from the Seneca basin, which has 2.36 times as large a drainage area.

Table 6.—*Drainage per square mile.*

River.	Drainage area above gaging station.	Mean flow, 1903-1905.	
		Cubic feet per second.	Cubic feet per second per square mile.
	Square miles.		
Oneida	1,313	3,410	2.60
Seneca	3,103	3,856	1.24
Oswego	4,990	8,187	1.64

For a number of the streams here considered the run-off data for the winter period have been omitted in order to eliminate such uncertainty as may arise in measuring snowfall and in gaging frozen streams.

The gaging record for West Canada Creek, which has been kept at Twin Rock Bridge, is less reliable for winter than for summer, and probably gives somewhat excessive results. Allowing for any probable error, the recorded run-off is still greater than can be accounted for from the measured winter precipitation. For the summer season the measured run-off and precipitation are consistent. This is shown by the following Table 7:

Table 7.—*Precipitation and run-off, in inches, West Canada Creek basin.*

May to November.			December to April.		
ear.	Precipitation.	Run-off.	Year.	Precipitation.	Run-off.
			1900-1901	16.61	17.78
1901	36.63	15.03	1901-1902	25.93	31.71
1902	34.25	26.17	1902-1903	26.21	34.24
1903	34.35	24.98	1903-1904	30.17	21.92
1904	30.30	22.90	1904-1905	14.93	20.47
1905	41.06	27.07	1905-1906	16.61	28.09
Mean	35.32	23.23	....	21.74	25.70

Similar data may be deduced from a comparison of the winter and summer records for other streams heading in the southwestern Adirondack slope. Such studies lead to the conclusion that the measured winter precipitation in this region is considerably less than the actual precipitation.

An effort has been made to ascertain the facts by the establishment of special snowfall stations, but for the present only general evidence is available. It is frequently reported, and the writer has himself seen late in winter, a snow accumulation in the woods of this region greater than the total reported precipitation for the winter at the nearest station.

The data cited are only a portion of those available indicating excessive run-off from the southwestern slope, as compared with either the observed rainfall or with the run-off from other Adirondack streams. The excess in case of the Moose, Beaver, and Black rivers is less marked than for east branch Fish Creek, upper Mohawk River, and West Canada Creek, indicating so far as such evidence may be given weight that the rainfall summit lies farther to the southwest and is more pronounced than appears from the available precipitation records.

RECENT ADDITIONS TO THE WEATHER BUREAU LIBRARY.

H. H. Kimball, Librarian.

The following titles have been selected from among the books recently received, as representing those most likely to be useful to Weather Bureau officials in their meteorological work and studies. Most of them can be loaned for a limited time to officials and employees who make application for them.

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Sur la marche annuelle de l'intensité du rayonnement solaire a Varsovie et sur la théorie des appareils employés... 1901-1905. Varsovie. 1906. viii, 202 p. 4.

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Progress and problems of solar physics during the last 50 years. (Repr. proc. Sioux City ac. sc. v. 2.) n. p. [190?] 18 p. 8°.

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Climate and health in Bangkok. (Repr. fr. Journal of the Siam soc. v. 3.) Bangkok. 1906. 20. 8°.

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Warsaw. Centralna stacya meteorologiczna Muzeum przemyslu i rolnictwa w Warszawie.
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H. H. KIMBALL, Librarian.

The subjoined titles have been selected from the contents of the periodicals and serials recently received in the Library of the Weather Bureau. The titles selected are of papers or other communications bearing on meteorology or cognate branches of science. This is not a complete index of the meteorological contents of all the journals from which it has been compiled; it shows only the articles that appear to the compiler likely to be of particular interest in connection with the work of the Weather Bureau. Unsigned articles are indicated by a ——

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M., W. Meteorology in Peru. (Jan. 24, 1907.) p. 283–284.
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—— Mesures de la hauteur des nuages à l'aide d'un réflecteur. p. 97–99.
Bracke, A. Formation symmétrique de cirrus convergent. p. 99–101.
B[racke], A. Mammato-cumulus observés au Caire. p. 104.
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Greim, G. Ueber die Änderung des vertikalen Temperaturgefälles durch Zusammendrückung oder Ausbreitung einer Luftmasse. [Abstract of article by M. Margules] p. 55.
Greim, [G.] Die barometrische Höhenformel und ihre Anwendung. [Abstract of article by L. Grossman.] p. 56.
Greim, [G.] Vergleichende Temperaturmessungen zu Marburg a. d. Lahn und seine barometrische Meereshöhe. [Abstract of article by A. Stützer.] p. 56–57.
U[ller], K. Die halbtägigen Schwankungen der Temperatur und des Luftdrucks. [Abstract of article by R. Börnstein.] p. 57.
K[önig], W. Meteorologische Optik. III. Abschnitt. [Abstract of work by Pernter] p. 57–59.
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—— Resultate der Regenmessungen im Jahre 1905. p. 339–391.
Linke, F. Die Regenverhältnisse Samoas im Jahre 1905. [Includes normals for 27 stations.] p. 339–351.
Naturwissenschaftliche Rundschau. Berlin. 21 Jahrgang. 29. Nov., 1906.
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Ellemann, Fr. Ueber die Sichtbarkeit des Petersberges. Dez., 1906. p. 278–283.
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Kaiser, Max. Historische Entwickelung unserer Kenntnis der Land- und Seewinde auf der Erde und Darstellung der gegenwärtigen Theorien. (Jan., 1907.) p. 1–11.
Prager, M. Eine Vorhersage der Regenfälle in Indien für das Jahr 1906. (Jan., 1907.) p. 11–16.
Zeitschrift für Gletscherkunde. Berlin. Band 1. Mai 1906.
Oyen, P. A. Klima- und Gletscherschwankungen in Norwegen. p. 46–61.
Memorie della Società degli spettroscopisti italiani. Catania. Vol. 36. 1907.
Bemporad, A., and Cavasino, A. Misure attinometriche eseguite nel R. Osservatorio di Catania dal Luglio all'Agosto 1905. p. 7–21.

THE CLIMATE OF KANSAS.

On January 8, 1907, in a hearing before the Committee on Agriculture of the House of Representatives at Washington, D. C., Professor Moore was asked certain questions in regard to rainfall and change of climate, which duty required him to answer. The following is a verbatim copy of the stenographic report of his testimony on that date, as published by the committee, and includes every word that was said bearing on rainfall or climate.

Mr. FIELD. With reference to the rainfall there is a question or two I would like to ask. A year or two ago I made inquiry of you with reference to the prevailing idea that in the arid country the rainfall is gradually increasing.

Professor MOORE. That is the popular opinion.

Mr. FIELD. Yes; but the impression in the public mind is such that a great many people may rely on it to their prejudice. Do you think there is to be a recurrence of dry years, just as there has been in the last three years a very perceptible increase in rainfall?

Professor MOORE. I have not any doubt of it. Many people have written to me and have said that they have been advised to buy land in this region now, and that it is two or three times what it was ten years ago in price, but that it is offered for sale to them on the ground that there has been a permanent change in the climate. They say they have had such-and-such rainfall for the past six years, and six years is a long time, and that therefore the climate has changed. I have answered and said no, it has not changed. It is true there has been a period of years in which there has been more than the average rainfall. But do not be deceived, there will come years when it will be just as short as it has been in excess.

We find, right in the arid regions, that during a long period of observations, thirty, forty, or fifty years, the average of the first ten years is precisely the same as the average of the last. I do not mean to say that there has not been a change in the climate on this continent [in geologic periods], for there has been a great change in the climate.

Mr. FIELD. What is the longest cycle of either dry or wet weather?

Professor MOORE. I can not answer that offhand, but my opinion is that the present long period of abundant rainfall over the great cereal plains of this country is the longest we have ever had a record of.

Mr. FIELD. At present?

Professor MOORE. At present; and I as confidently look for as long a period of drought. I think the people ought to take cognizance of that, instead of proceeding on the theory that they are going to have an abundance of rainfall and big crops; they should realize that the time is now coming when we will have to go through a drought and a shortage of crops.

Mr. BROOKS. There is another popular misconception, that while the average rainfall has not increased materially, the distribution has been equalized; for instance, that 13 inches twenty years ago was the result of eight or ten heavy storms, and now it is the result of 50 storms, spread along through fifty weeks. Is there anything in that?

Professor MOORE. Not exactly the way you state it; but there is something in this, that the same amount of rainfall is better conserved, because of better methods of cultivation.

Mr. BROOKS. That goes to the cultural methods?

Professor MOORE. There is one other test. We are breaking up virgin soil and planting trees. While not increasing the rainfall, it will make the same amount more efficient and more profitable, because the soil is broken up and there will not be as much run-off. It is retarded and kept from running off, and there is not so much evaporation. The same amount of rain that you got before is more perfectly absorbed.

Mr. FIELD. That would not make what has heretofore been an arid country a safe agricultural country?

Professor MOORE. No.

The CHAIRMAN. Professor, how many wet seasons have we had, in your judgment, consecutively?

Professor MOORE. Six seasons, from my recollection.

The CHAIRMAN. In that time, as I understand it, Mr. Brooks thinks that dry farming has been built up?

Mr. BROOKS. In four years the dry farming method has come in.

The CHAIRMAN. Suppose we strike a number of dry seasons—I wonder whether we can carry on that dry farming?

Professor MOORE. Probably not in the places where you have attempted it.

The CHAIRMAN. We are inducing a number of people to move into this dry country, and if a dry cycle follows a wet season they will get in trouble.

Mr. HENRY. Mr. Mead[1] made the point on that last year.

Mr. BROOKS. The whole theory of Mr. Mead's work is to me a warning and demonstration of what the limits of successful dry farming are. Its limits are very closely defined. The Department is working along exactly the line Doctor Moore has now outlined in counteracting this overconfidence.

The CHAIRMAN. It is a land boom.

Mr. BROOKS Yes.

Professor MOORE. A great many people have bought land, I am very confident, from letters that I have received, in a region which in the majority of years will not be productive.

The CHAIRMAN. Lands that are not commercial propositions?

Professor MOORE. Yes. I have written a number of letters to people who have asked me for advice advising them not to buy anything on the ground that it will be productive unless it was productive ten years ago.

Mr. SCOTT. You stated a while ago that we would not have any rain except for the dust particles in the air.

Professor MOORE. Precisely.

Mr. SCOTT. I presume that implies that the fewer dust particles we have in the air the less rainfall we are likely to have.

Professor MOORE. It may be that it would depend somewhat on the size of the dust particles. That we do not know yet.

Mr. SCOTT. The question I was leading up to is whether, in your judgment, it is possible that the breaking up of this country out in the semiarid West might perhaps create a sufficiently large quantity of dust particles to make any difference in the rainfall.

Professor MOORE. I should think not. I think the dust particles that come from such action would not enter into this question.

Mr. SCOTT. Another thing. In relation to the winds in the Western States, I will say that I have lived all my life in eastern Kansas, and I know that we do not have the winds there that we did twenty-five years ago.

Professor MOORE. You have more trees to restrict the blow. You do not feel it as much near the ground.

Mr. SCOTT. Another fact in regard to that is this: Dr. Frank H. Snow, of the University of Kansas, has been making a daily weather observation for more than forty years. His wind instruments are on top of the State University, which is on the summit of a hill just about 300 feet above the surrounding country.

Professor MOORE. Yes.

Mr. SCOTT. The university building is quite high, so that if there is a wind he gets a record of it.

Professor MOORE. Where is it located?

Mr. SCOTT. At Lawrence, Kans. He reports that there is very much less wind now than there was forty years ago when he began.

Professor MOORE. We have some records for the last thirty years. I would like to compare that. Sometimes an instrument that is left to work for a long time, and which is not properly lubricated, will show a deficiency in the blowing of the wind, when it is an instrumental fault, so I would want to compare that with our instruments. We take down an instrument once every seven days and replace it with another that we know is thoroughly lubricated, to be sure that there is no defect in the apparatus. I am not saying that he is not right, because of the fact that the trees that have been planted in that region will restrict the blowing of the wind; but I am quite certain that there has been no change in the general high velocity for, say, an altitude of 50, 60, or 100 feet. I am going to lecture in Emporia next week, if I get away from the committee on time, and I would like to ascertain about the Lawrence record.

Mr. SCOTT. I wish you would stop at Lawrence and talk with Doctor Snow.

Mr. COLE. Is there any difference in the mean temperature of the United States now and fifteen years ago?

Professor MOORE. I should say not.

Mr. COLE. There is less snow out in Ohio than there was.

Professor MOORE. No; if you go back to Thomas Jefferson, and he was a pretty good authority in his day, you will find among his papers in the State Department, where he wrote: "It is apparent that the climate of Virginia has changed. The old inhabitants here tell me that they remember when snow lay on the ground four months every year and they rode in sleighs." Now, he says, it is rare that we get enough snow to have a sleigh ride. He said it is apparent the climate of Virginia has changed since 1607, when the settlers came into Jamestown. But it has not changed.

The CHAIRMAN. There might have been some reason. It was a thickly wooded country, was it not?

Professor MOORE. There was a great deal of clearing in that time, but that would not change it. The change was in the man who was telling the story. We measure things by a different standard as we grow older. Every man when he gets to be 50 years of age will look back and think of one great snowstorm, and he will say: "We had snow 4 feet deep all winter long," because all he remembers as he thinks back is the one snowstorm. He remembers the abnormal, and in his mind brings it down to the present day and compares it with the average. But it is not a fair comparison.

Mr. COCKS. Like the blizzard of 1888.

Professor MOORE. Precisely. When you get old enough you will be telling your boys that that occurred every winter.

The CHAIRMAN. We are very much obliged to you, Professor.

The committee (at 3:50) adjourned until to-morrow, Wednesday, January 9, 1907, at 10:30 o'clock a. m.

[1] Mr. Elwood Mead, Chief of Irrigation and Drainage Investigation, Office of Experiment Stations, Department of Agriculture.—EDITOR.

It will be seen from the above that not a word was said by Professor Moore about the climate of the State of Kansas. But for some unexplained reason newspapers and correspondents who desired to injure that State, or possibly to injure the reputation of the Weather Bureau, disseminated fraudulent statements regarding this testimony; the blame for thus creating a false impression as to the climate of Kansas must rest upon them and not upon the Chief of the Weather Bureau. Professor Moore adds the following, based upon the official records of observations by the hundreds of observers who have reported to the Weather Bureau, the medical staff of the Army, and the Smithsonian Institution:

It is my duty to publish the simple, ungarnished facts in regard to the climatic conditions of the United States. Our people want the truth so that they may not be misled either by those who honestly, but nevertheless ignorantly, claim that hot winds and droughts will never again come, or by those who, when periods of deficient rainfall occur, as they have in the past and as they certainly will in the future, preach discouragement and the abandoning of lands which, on the average of a long period of years, it would be profitable to cultivate.

I have made a careful examination of the Government records, with a view of putting before those interested in the matter a correct statement regarding the rainfall and wind of both Kansas and Nebraska. These records are made by trained observers and represent the most accurate information that is obtainable. The Government records, as is well known, are in a class separate and distinct from the recollections of the oldest inhabitants.

In the last fifty years records of rainfall in Kansas have been made only in the eastern part of the State. In the western part of the State, which is really the debatable ground, a single record has been made, viz, at Dodge, extending back to 1875. Likewise in Nebraska, the record for North Platte is the only one that extends back to the early seventies. The mean annual rainfall at Dodge for the entire period of observation is 20.8 inches, and at North Platte, 18.7 inches.

Considering the record for the last thirty years only, since it is convenient to subdivide that number into periods of equal length, the mean becomes for Dodge, 21.3 inches, and for North Platte, 19.0 inches. I have also had computed the average rainfall for 3 additional stations in Kansas, 3 in Nebraska, and 1 each in Iowa and Missouri for the last thirty years, to see whether the conclusions reached from a consideration of the Dodge and North Platte data are of local or general application. The averages in periods of ten years each appear in the table below, from which it may be clearly seen that the first and last ten years were periods of fairly abundant rainfall, and that the middle ten years was a period of deficient rainfall. It will be further seen, and this is the important point in the discussion, that there is practically no difference between the rainfall of the first ten years and the last ten years. Three of the ten stations show that the last ten-year period had a slightly greater rainfall than the first, but the difference is so small that it is really immaterial. The remaining stations show a slightly less rainfall in the last ten years than in the first. This table clearly shows, therefore, that the rainfall has neither increased nor diminished by amounts worthy of consideration.

The heavy rains of 1906, and also the year previous, were common to all of that vast stretch of territory west of the ninety-fifth meridian. It was not a local phenomenon centered in western Kansas and western Nebraska, since equally heavy rains fell in Colorado, Utah, western Texas, Oklahoma, New Mexico, Arizona, Nevada, and central and southern California. The explanation of the heavy rains can not be attributed to local conditions of soil and moisture, since, as has just been stated, the heavy rains were common to the arid and mountain regions of the Southwest, where very little agriculture is practised.

Mean rainfall at the stations named.

Stations and periods of observation.	For the full period of observation.	For the 30 years 1877-1906, in periods of 10 years.			
		First.	Second.	Third.	Mean.
	Inches.	*Inches.*	*Inches.*	*Inches.*	*Inches.*
Dodge, Kans., 1875-1906	20.8	22.8	18.4	22.7	21.3
North Platte, Nebr., 1875-1906	18.7	20.1	17.2	19.8	19.0
Independence, Kans., 1872-1906	37.1	39.1	35.5	38.1	37.6
Genoa, Nebr., 1875-1906	28.2	26.3	26.4	31.3	28.0
Manhattan, Kans., 1858-1906	30.6	33.4	29.2	31.9	31.5
Lawrence, Kans., 1868-1906	36.4	35.1	39.2	36.7	37.0
Omaha, Nebr., 1871-1906	30.7	37.6	25.6	27.9	30.4
Minden, Nebr., 1878-1906	31.5	36.1	29.2	29.8	31.7
Oregon, Mo., 1866-1906	35.6	37.1	32.3	39.5	36.3
Keokuk, Iowa, 1872-1906	35.0	35.4	31.4	35.1	34.3

The statement has also been made that the winds are diminishing. An examination of the wind records in Kansas and Nebraska shows that the last fifteen years have not been quite so windy as the fifteen years previous, and this is especially true of the years 1904, 1905, and 1906. It is not safe to assume, however, that a permanent decrease in the wind velocity has taken place.

As the citizens of Kansas, like those of other States, have learned how to adapt their lives and their agriculture to local climatic conditions, it is very important that correct climatological information be disseminated, so that all citizens may understand exactly what the peculiarities of the local climate are, and be prepared to take advantage of them. To do this the figures given in the preceding table should be quoted and studied, and together with these one should consider the records of sunshine and temperature, for everyone knows that plants and crops can be raised in any climate, and that every region on the globe has its advantages as well as its disadvantages.

WATERSPOUTS IN MARYLAND.

By WILLIAM L. MAYO. Dated Tarlac, Tarlac Province, P. I., December 22, 1906.

Among the valuable articles contained in the MONTHLY WEATHER REVIEW, I have been especially interested in the articles in the July and August numbers of this year telling about the waterspout in Vineyard Sound. Reading the differences of opinion as to whether there were two well-defined spouts or just one in different phases recalls to my mind two waterspouts that I saw a short distance inside the mouth of Chester River, Maryland, Saturday, July 13, 1901. I made a note of them in my diary, but unfortunately neglected to note other conditions at the time. The conditions that I remember distinctly are as follows:

The waterspouts appeared very nearly simultaneously about two o'clock in the afternoon, at the close of a heavy wind and rainstorm that had lasted, with rather unusual force for a summer storm, since very early that morning, and the storm came from the east. I was a member of the State militia at the time, and we had embarked on the yacht *Sylvia* and gone up Chesapeake Bay to Queenstown, Md., where we were to encamp for ten days. A high sea was running from the force of the wind, which blew in heavy puffs and did not draw steadily as our winds from that direction usually do. We had dropt anchor opposite our landing, and were waiting for the small boats to carry us ashore. I was seated at the stern of the vessel when my attention was called by a hollow, roaring sound to a small waterspout moving past, parallel to the east shore of a small island that was about a half-mile from us. While I was watching that, some one said excitedly, "Look at this other waterspout," and on the west side of the island there was another waterspout more than double the size of that on the east side. The smaller one, which was on the east side, began first, and was in action fully three minutes before the second and larger spout on the west side appeared. They were in violent action at the *same time* for at least five minutes (I make conservative estimates as to the duration of the intervals); then the smaller began to waver in the center of its column, the base half dropt down with a sullen roar, and the upper portion waved a few moments like a streamer and disappeared. The cloud portion of the smaller waterspout began to drift toward the cloud portion of the larger spout, and it lookt very much as if the smaller spout was put out of action because its aerial whirl was drawn into the whirl of the larger spout. Before the first spout had quite disappeared, the volume of the second increased rapidly and its rotation became more violent, the cloud bulged downward, and had an ugly, blackish-gray hue. The water was churned into foam and the whole mass dragged itself along for a few minutes more, making a rushing, roaring sound. A small point of land lay in the course of the spout, and when the base reached the shore the column suddenly broke and fell on the point, among the trees. The column of falling water was more than twice as high as the trees, and when the air cleared of the mist there

was a well-defined path thru the woods; none but the tall, strong trees were standing, and these had their branches very nearly all stript off. When the spout was relieved of the weight of its base it swung out in a long, flattened curve, very much like a long rope hanging from a ship's rigging when one end is free and the wind is blowing.

We were surprised to see such an unusual demonstration at that time, because we were at anchor in calm water; for the storm had lost its energy fully a half hour before the appearance of the two spouts. It was sultry and hot where we were, and the sun was not shining directly on us, yet the clouds seemed so thin that the heat came thru very readily and diffused itself in the still air. The trees on the surrounding shores showed no evidence of wind, nor did the surface of the water. It was a dead calm, except for a little swell. I recall no thunder and lightning during the morning storm nor at the time of the waterspouts. That evening, shortly after sunset, we had a terrific thunderstorm, and during all the encampment we had severe thunderstorms and floods of rain. As we were living in tents, life was far from pleasant. * * * I have left out uncertainties, and the only part that might be doubtful is whether the larger spout was on the west side of the island or whether the spouts occurred in reverse directions from what I have stated. The sun was not shining nor do I know the direction of the tide, hence the points mentioned above might be questioned, but not their actual occurrence.

WEATHER BUREAU MEN AS EDUCATORS.

Dr. O. L. Fassig, on January 10, 1907, delivered the first of a series of ten lectures on "Weather and climatology" at Johns Hopkins University, Baltimore, Md.

Under date of January 30, 1907, Mr. M. L. Fuller, Observer, Canton, N. Y., reports that the teaching of meteorology in the St. Lawrence University at Canton has been properly recognized by his formal election as "Professor of Meteorology and Climatology", with voice and vote in the faculty. His course of instruction for junior and senior students involves two or three one-hour lectures per week, and by unanimous request of the students enrolled therein the work will be extended thru the remainder of the college year. A course embracing only one semester in climatology has also been outlined for other students who can not take the full course.

Arrangements have been made for a course of eighteen lectures on meteorology and climatology before the Clarkson School of Technology, at Potsdam. The students will be examined in these lectures and receive credit for one hour's work per week. A popular lecture committee representing the University, the School of Technology, and the State Normal School desires also a series of popular lectures. An average of about twelve hours a day has been given to meteorological work since July 1 by Mr. Fuller, and a considerable amount of time by his wife. He has also arranged to employ, at his own expense, an assistant to aid in the preparation of material for class work and lecture work, which expense will consume all of the special allowance made for these lectures by the above-mentioned committee. This extra work has been undertaken in the interest of the service, as the field appeared to be a most promising one.

In later reports Mr. Fuller states that the class beginning the work in general meteorology at St. Lawrence University numbers 28, and 10 of the 90 students of Clarkson School of Technology are enrolled for the course at that institution.

Owing to the absence of the head of the department of geology at the University Mr. Fuller has taken charge of the class in physiography, numbering 20 students. A large portion of the remainder of the course, relating to the atmosphere, the topography of the lands, the climatic control of land forms, etc., will be easily combined with the course in climatology.

Mr. J. Warren Smith, Section Director, on January 3, 1907, began regular lectures to the class in elementary meteorology at the Ohio State University, Columbus, Ohio; the lectures are given twice a week during the winter term.

Mr. A. H. Thiessen, Section Director, Raleigh, N. C., on January 19, 1907, began his regular course of lectures to seniors in the agriculture course at the Agricultural and Mechanical College, West Raleigh; the course will be practically the same as that given last year.

Mr. John R. Weeks, Local Forecaster, Binghamton, N. Y., under date of February 16, submits a manuscript lecture "On the weather—what it is and how it is observed and forecast". The text occupies about sixteen pages of manuscript, and is accompanied by a list of about a hundred slides, belonging to the Weather Bureau. When the lecture is transmitted for use copies of brief printed articles are also inclosed for the use of the lecturer, who is asked to read them and present a synopsis of their contents in connection with the exhibition of the slides. There are more slides in this lecture than in those usually delivered by the New York State Department of Education in order to provide additional popular interest. It is expected that the lectures and notes will be memorized, and that the lecturer will not read from the manuscript. Mr. Weeks states that this lecture has already been read and the slides exhibited by five persons to whom it has been loaned, and that about forty requests for its loan were received during February. He suggests the practicability of placing such a lecture, "localized for each State", in the hands of each section director, to be loaned to schools, free of cost, for public use.

This recommendation is quite in line with the work that has been done in the State of New York during the last twenty years by Prof. Albert S. Bickmore, "father" of the American Museum of Natural History in New York City. Thru his efforts in the line of geography and travel the Education Department of the State has organized a Division of Visual Instruction, of which Mr. De Lancey M. Ellis is now chief; and Mr. Ellis has issued a circular letter, dated Albany, February 1, 1907, in which he indorses Mr. Weeks's efforts and explains the conditions under which his lecture can be obtained:

> Mr. Weeks offers to send the manuscript and slides without cost to any school in the State, under the general rules governing the loan of slides issued by this department. These provide that slides shall not be used for other than educational purposes, nor upon any occasion at which an admission fee is charged or a collection of any kind is taken. Borrowers must also agree to bear cost of loss or breakage. Slides are sent by mail under Government frank, and provision is made for their return in the same way.

We heartily indorse the following paragraph from one of Mr. Weeks's letters:

> A high official once said to me that it is a waste of time to lecture to high school students and that lectures to older people were more important. My belief and experience is just the opposite, for at least two reasons. It is much easier to reach, interest, and convince high school students, and once interested they have time and opportunities for studying the subject that older persons do not have. Their minds are also free from the notions that older persons so easily get in regard to the weather. The high school boys and girls of to-day are the business men and women of four or five years from now; but now is the time to reach them with such instruction, not when they are absorbed with business cares and worries.

The Department of Education of the State of New York, with its headquarters at Albany, and Dr. Andrew S. Draper as Commissioner of Education, seems to have associated together under it the Regents of the University, the Director of the State Library, the Director of the State Museum, the Division of Visual Instruction, under De Lancey M. Ellis, and many other branches of activity bearing on education thruout its whole range from the kindergarten to the university. The

circulars that it has published, especially the syllabus for secondary schools in physical geography and agriculture, and the catalogs of lantern slides, arranged in sets, accompanied by printed lectures, should be known to all teachers in this country and elsewhere.

Mr. Wilford M. Wilson, Section Director, Ithaca, N. Y., reports that he will begin the regular course of instruction in meteorology at Cornell University with the opening of the second term, February 2, 1907; the course calls for three weekly periods of one hour each, and extends thru the remainder of the school year.

A typewritten syllabus of the course has been prepared, based on Davis's Elementary Meteorology. About two hundred slides have been collected for illustrative purposes, and the facilities for teaching have been considerably improved.

The following lectures and addresses by Weather Bureau men have been reported:

Mr. W. H. Alexander, January 17, 1907, an address to the physical geography class of the Burlington, Vt., High School; also January 30, 1907, at the Young Men's Christian Association Hall, Burlington, on "The Weather Bureau and its methods", with lantern slide illustrations.

Prof. F. H. Bigelow, January 22 and 23, 1907, at the University of Chicago, under the auspices of the departments of geography and economics, on "The circulation of the sun's atmosphere as the first cause of the annual changes in the weather", and "The circulation of the earth's atmosphere, and the new theory of storm energy".

Mr. F. H. Brandenburg, before the Trans-Missouri Dry Farming Congress, at Denver, Colo., on "The western limit of sufficient precipitation for successful farming without irrigation".

Mr. M. L. Fuller, during October, 1906, before the Silas Wright Grange, Canton, N. Y., on "The work of the Weather Bureau"; also January 25, 1907, before the Farmers' Institute, Canton, and January 28, before the Farmers' Institute, at Gouverneur, N. Y., on "The weather and the farmer's boy".

Mr. C. F. von Herrmann, January 14, 1907, before pupils of the Western High School, Baltimore, Md., on "Forecasting and storms", with lantern slide illustrations.

Prof. A. G. McAdie, January 30, 1907, before the physiography class of the San Diego (California) State Normal School on "A raindrop".

Mr. W. S. Palmer, of the Cheyenne, Wyo., office, January 26, 1907, before the Trans-Missouri Dry-Farming Congress, at Denver, Colo., on "The rainfall of southeastern Wyoming".

Mr. J. Warren Smith, January 11 and 14, 1907, before the students of the special short course in agriculture, at the Ohio State University, Columbus, Ohio, on "The work of the Weather Bureau", and on "Frost warnings and protection from frost, and lightning rods"; also, January 18, 1907, at the annual meeting of the State Horticultural Society, on "The protection of crops from frosts".

Mr. J. F. Voorhees, October 6, 1906, before the Knoxville Teachers' Association, on "Weather forecasting"; also, January 14 and 15, 1907, before the short course agricultural students of the University of Tennessee, Knoxville, Tenn., on "General meteorology" and on "Practical forecasting and the work of the Weather Bureau", with lantern slide illustrations.

Mr. J. R. Weeks, January 17, 1907, at the Public Library, Binghamton, N. Y., on "The work of the United States Government, especially the Weather Bureau", with lantern slide illustrations.

Classes from universities, schools, and academies have visited Weather Bureau offices, to study the instruments and equipment and receive informal instruction, as reported from the following offices:

Cairo, Ill., January 16, 1907, the class in physical geography from the Cairo High School.

Chicago, Ill., during the six months ending in January, 1907, classes from University of Chicago, Northwestern University, Chicago Normal School, Morgan Park Academy, South Division Manual Training School, Hoyne High School (two divisions), Hyde Park High School (three divisions), Bernard Moos High School, and Austin High School.

Columbus, Ohio, January 9 and 10, 1907, three classes in physical geography or meteorology.

Mobile, Ala., January 11, 1907, the class in physics from McGill Institute.

Pensacola, Fla., January 10 and 14, 1907, the class in physical geography from the local high school, in two sections.

Portland, Oreg., January 16, 17, 18, 22, and 23, 1907, classes from the local high schools.

Rochester, N. Y., January 30, 1907, the class in meteorology from the University of Rochester.

San Diego, Cal., January 23, 1907, the graduating class from the Angier Grammar School.

Savannah, Ga., January 25, 1907, the class in physical geography from Miss West's preparatory school.

Springfield, Mo., January 18, 1907, the class in physical geography from the local normal school; also, January 19, 1907, a class in physical geography from Republican, Mo.

THE CLIMATE OF YUKON TERRITORY.

By R. F. STUPART, Director of the Meteorological Service of Canada. Dated December 15, 1906.

[Reprinted from Transactions of the Canadian Institute, Vol. VIII.]

Meteorological observations were begun at Fort Constantine, Yukon Territory, in November, 1895, by Staff Sergeant Hayne of the Royal Northwest Mounted Police. In September, 1897, the instruments were removed to Dawson and observations were continued voluntarily by the police and by the Commissioner of the Yukon until 1900, when the duty of observing was taken over by the meteorological service, and an unbroken record has since been obtained at Dawson. Other records in Yukon in the possession of the meteorological office are as follows: Selkirk from November, 1898, to November, 1899; Tagish Lake from August, 1898, to August, 1900, and White Horse from November, 1904, to the present time. In addition to these Yukon stations, a station at Atlin, B. C., but 25 miles south of the boundary, was opened by the meteorological service in August, 1905, and will be of assistance in determining the climatic conditions of southern Yukon.

A study of all available data leads to the conclusion that while Dawson is farther north than White Horse, the climate of the former place is much more suitable for agricultural purposes than that of the latter, and in general that the northern and eastern portions of Yukon have a warmer summer climate than have the more southern portions. This is probably owing in part to the fact that the former are at a lower level than the latter, and in part to the fact that southern districts are much nearer the ocean from which the westerly winds blow; while in the north the westerly winds are from the broader land area of Alaska, and the country generally is protected by mountains ranging from 5000 to over 10,000 feet. The mean summer temperature at Dawson is fully 5° F. higher than at either White Horse or Atlin, B. C.; and while frosts seem to be frequent at the latter places in both June and August and occur occasionally even in July, in the former both June and July are practically free from frost and it is not until about August 20 that there is much danger; and very frequently September opens with as yet no frost. After the close of August the downward trend of the Dawson temperature curve is very rapid, and the winter months are probably between 15° and 20° colder than at White Horse. A summary of the general conditions of each month at Dawson will probably give the best idea of the climate.

January.—The average mean of this month at Dawson is about $-24°$ F. and the temperature seldom rises above zero; in some years never. On twenty-one days, or about two days in three, the temperature falls to $-20°$ F. or lower; on eleven days, or about one day in three, it falls to $-40°$ F. or lower.

The days of $-50°$ F. or lower are more variable in number; the average is about one in six, but in eleven years there have been some Januarys with fourteen or fifteen days $-50°$ F. or lower, while there have been others with not one or only one $-50°$ F. A spell of $-60°$ F. or lower seems to occur every few years. The lowest temperature on record is $-68°$ F. in 1901. The two coldest Januarys were those of 1896 and 1905, the former with an average temperature of $-38°$ F. and a minimum of $-65°$ F., and the latter with an average of $-34°$ F. and a minimum of $-66°$ F. The mildest January was that of 1901, with a mean of $-15.5°$ F. and minimum of $-50°$ F.

At Selkirk the conditions during the month are very similar to those which obtain at Dawson. At White Horse the mean is about 20° F. higher than at Dawson and the monthly range of temperature is more pronounced; comparatively mild days occur occasionally and extremely low temperatures do not occur so frequently, altho some of the lowest dips reach about the same reading as that recorded at Dawson. At Tagish Lake the mean is about 15° F. higher than at Dawson, and cold dips are not so severe.

February is usually much milder than January, the average mean temperature being about $-12°$ or 12° warmer than January. The coldest February of which there is record was that of 1896 with a mean of $-23°$ F., and the warmest that of 1897 with a mean of $-3°$ F. In the former month $-60°$ F. or lower was recorded twice, but in no other February excepting that of 1903 did the thermometer record as low as $-50°$ F. In 1897, $-31°$ F. was the lowest; this February was remarkable also from the fact that the temperature rose above the freezing point on sixteen days, whereas in no other year was 32° F. reached. On the average there are three days on which the temperature does not fall to zero; it falls to $-20°$ F. on fourteen or fifteen days, and to $-40°$ or below on four or five days. Other stations also show that February is not as cold a month as January.

In March the monthly average at Dawson is 5° F.; on an average zero is reached on nineteen days, and $-20°$ F. on eight days, while $-40°$ F. may be recorded, but is unusual; and $-50°$ has not been recorded since March, 1897. The temperature in this month frequently rises above 32° F., and 50° F. is occasionally reached. The more southern stations show a mean temperature about 10° F. higher than Dawson.

April may well be termed the first spring month, as there are few days on which the thermometer does not rise above 32° F., and 50° F. is occasionally recorded. The average mean of the month is 28° F., and in some years the temperature does not fall to zero. The precipitation is usually in the form of snow, but rain sometimes falls. In this month the average temperature is very approximately the same thruout the Yukon.

May has an average mean of 46° F. at Dawson, and there are few days on record on which the temperature has remained below freezing all day; 50° F. or higher is reached on twenty-four days; 60° F. on nine days and there are many records of 70° F., notably in the years 1905 and 1906, with ten days of 70° F. in the former and seven in the latter. The average date of the last frost is the 19th.

The ice on the Yukon at Dawson usually breaks up between the 15th and the 20th, but not until a fortnight or three weeks later on Lake Laberge. The season is now further advanced in the north than in the south, and it is not until the end of August or early September that the mean temperature in the north is again as low as at White Horse or Tagish.

June is a perfect summer month, and with practically no darkness, and nearly twenty hours of bright sunshine on fair days, vegetation advances very rapidly. Frost, while not unknown in this month, is quite unusual. The average daily maximum temperature is 70.5° F. and the daily minimum 45.2° F., giving an average mean of 57.5° F.; 70° F. is on the average reached or exceeded on sixteen days, 80° F. or higher on four days, and 90° F. was recorded in June, 1899.

July weather in Dawson is quite fairly comparable with that in the same month in southern Alberta, and with the longer days growth is probably more rapid in the former locality than in the latter. The average mean temperature is 60.4° F., with an average maximum of 72.7° F. and an average minimum of 48.1° F. There are very few days on record when the temperature did not reach 60° F., and 70° F. is reached on the average twenty days in the month; 80° F. is reached on six days, and there are a few instances of 90° F.

The August mean temperature is 54.5° F. The month opens warm, but a very decided downward trend of the temperature curve occurs after about the 15th, and there seems to be decided danger of frost after the 20th. It is still quite early autumn when the temperature of Dawson drops below that of White Horse and the southern Yukon generally; and the difference, as has been shown, becomes more and more pronounced until after midwinter.

With a mean temperature of 41.6° F. in September and an average daily minimum little above freezing, autumn is soon well advanced in Dawson, and the temperature sometimes falls below 10° F. before the month closes.

October is winter, with a mean temperature of 24.1° F., and zero readings well before its close. Toward the end of this month ice begins to run in the Yukon, but it is not until about ten days later that the river sets fast.

The November mean is $-1°$ F.; the temperature very seldom rises to the freezing point; on twenty days it falls below zero, and on seven to $-20°$ F. or lower, with an occasional dip to $-40°$ F.

The December average mean temperature at Dawson is $-10°$ F.; the highest mean in ten years was zero, and the lowest $-18°$ F.; readings below $-40°$ F. are usually recorded on about three days each December, and $-50°$ F. may be reached; there are few days on which zero is not recorded. The White Horse average temperature is nearly 20° F. higher than that of Dawson.

Short as have been the temperature records in Yukon Territory, even at Dawson, those of precipitation have been shorter, covering a period of but five years at Dawson and much less at other stations.

As an approximation, however, the annual snowfall in the Yukon is about 52 inches and the rainfall 7.5 inches. July, August, and September are the months of largest rainfall, each averaging a fall of something under two inches, much of which comes with thunderstorms. Most of the snow falls late in the autumn, but occasional light falls occur up to April or even May.

The following are the hours and minutes on the 21st day of each month that the sun is above an unobstructed horizon in the latitude of Dawson: January, $5^h\ 55^m$; February, $9^h\ 15^m$; March, $12^h\ 10^m$; April, $15^h\ 38^m$; May, $18^h\ 51^m$; June, $20^h\ 48^m$; July, $18^h\ 54^m$; August, $15^h\ 39^m$; September, $12^h\ 10^m$; October, $9^h\ 8^m$; November, $5^h\ 50^m$; December, $4^h\ 1^m$. As a matter of fact, however, Dawson, together with many other of the centers of habitation, is so much closed in by mountains and hills that the actual period of sunshine is less than indicated by the figures.

It is claimed that there is little wind at Dawson in winter, and this is to a large extent true. The cyclonic areas which enter the continent from the Pacific pass far to the southward of latitude 64° north, hence barometric gradients are not usually steep.

PROBLEMS IN METEOROLOGY.

By C. F. VON HERRMANN, Section Director. Dated Baltimore, Md., June 9, 1906.

[Continued from December, 1906, p. 579.]

Problem 18.—Given a cubic meter of dry air at the temperature of 30° C. under standard pressure, 760 millimeters, and let it become saturated with vapor; find the formula expressing its increase in volume when the pressure and temperature remain constant, and the air continues to be saturated at the final volume.

Solution.—In general, if water evaporates into dry air under constant pressure, the elastic force of the mixture is increased by the amount of the vapor tension, and if allowed to expand the mixture will increase in volume; if sufficient vapor be added to saturate the increased space, then the increased volume (final volume of the saturated air at the given temperature) may be calculated as follows:

Let the mixture expand to the volume V^1, so as to maintain the same pressure, p, and temperature. If the mixture is then saturated with vapor, the new volume will consist of V volumes of dry air, and $V^1 - V$ volumes of aqueous vapor.

Since, by the law of Boyle-Gay Lussac, $p\,V = p^1\,V^1$ (the volume varies inversely as the pressure, or pressure inversely as volume) then the pressure of the volume V of dry air will be $p^1 = p \times V/V^1$. The pressure of $V^1 - V$ volumes of vapor will be e, ($p^1 + e$ must equal p or 760 mm.).

Then the mixture will be composed of

V volumes of air under pressure $p \times V/V^1$

$V^1 - V$ volumes of vapor under pressure e.

The total pressure of the mixture

$$p = e + p \times V/V^1$$
$$V^1 p = V^1 e + p\,V$$
$$V^1 p - V^1 e = p\,V$$
$$V^1 = p\,V/(p - e).$$

Therefore the increased volume is $p/(p - e)$ times the initial volume. If the initial volume is 1 cubic meter, the increased volume is

$$\frac{p}{(p-e)} \quad \ldots\ldots\ldots\ldots (1)$$

(See Abbe's Treatise on Meteorological Apparatus, p. 348.)

One cubic meter of dry air at $t = 30°$ C., pressure = 760 mm., when saturated with aqueous vapor and allowed to expand, will have a final saturated volume of $760/(760 - 31.51)$ which is equal to 1.0432 cubic meters.

The student should be required to construct a table showing what a unit volume of dry air becomes when saturated, at various temperatures.

The weight of vapor in a saturated cubic meter of space at 10° is 9.34 grams. Prove this in another way:

One cubic meter of saturated air at 10° weighs 1241.6 grams.

One cubic meter of dry air at 10° weighs 1247.3 grams. This cubic meter of air, however, in becoming saturated expands to 1.0122 cubic meters (found as above). Therefore, 1 cubic meter of this expanded air weighs only 1232.26 grams.

Therefore, of the 1 cubic meter of saturated air which weighs 1241.6 grams, 1232.26 grams are dry air, and the remaining 9.34 grams are vapor; which agrees with the above.

Problem 19.—What volume of saturated air has the same weight as 1 cubic meter of dry air, both being at the same temperature and pressure?

Solution.—One cubic meter of dry air weighs $\dfrac{1293.05\,b}{(1 + a\,t)\,760}$ grams $= (A)$.

One cubic meter of saturated air weighs $\dfrac{1293.05\,(b - .378\,e)}{(1 + a\,t)\,760}$ grams $= (B)$.

Therefore, 1 gram of saturated air occupies the reciprocal of B or

$$\frac{(1 + a\,t)\,760}{1293.05\,(b - .378\,e)} = n \text{ cubic meters.}$$

If one gram of saturated air occupies n cubic meters, then A grams will occupy $A\,n$ cubic meters or

$$\frac{(1 + a\,t)\,760 \times 1293.05\,b}{1293.05\,(b - .378\,e)\,(1 + a\,t)\,760} = \frac{b}{(b - 0.378\,e)}.$$

If the pressure is 760 millimeters and the temperature 0°C., then $760/758.25$ or 1.0023 cubic meters of saturated air will weigh the same as 1 cubic meter of dry air at 0°.

Proof.—One cubic meter of saturated air weighs 1290.08 grams; then 1.0023 cubic meters will weigh 1290.08×1.0023 grams which is exactly equal to 1293.05 grams, the weight of a cubic meter of dry air at 0°C.

Problem 20.—At what temperature will a cubic meter of saturated air have the same weight as a cubic meter of dry air at the temperature t?

Solution.—Let t be the temperature of the dry air and t' that of the saturated air; then the weight of a cubic meter of dry air at t is to be equal to the weight of a cubic meter of saturated air at t' or

$$\frac{1293.05\,(b - .378\,e)}{(1 + a\,t')\,760} = \frac{1293.05\,b}{(1 + a\,t)\,760}.$$

Solving for t' gives $t' = t - .378\,(e/b)\,t - 103\,(e/b)$. If we take the simple case where the temperature of the dry air is 0° this gives the temperature of the saturated air of the same weight as $t' = -103\,(e/b)$ which is $-0.62°$ C.

Problem 21.—A cubic meter of dry air at any pressure is mixt with a cubic meter of vapor, the mixture being allowed to expand under a given atmospheric pressure. No more vapor is added, so that at the expanded volume the space is not saturated. What is the increase in the volume of the mixture?

Solution.—We have to calculate the volume of a mixture of 1 cubic meter of dry air under any pressure B with 1 cubic meter of vapor, not necessarily saturated, under the tension e, when the mixture is allowed to expand freely under the pressure b.

The first effect of the mixture may be considered to be the formation in a rigid enclosure of 2 cubic meters of a mixture whose total elastic pressure is $\frac{1}{2}\,(B + e)$. If these two cubic meters are confined, not by a rigid inclosure, but by the atmospheric pressure b, then they assume a new volume V' such that

$$2\left(\frac{B}{2} + \frac{e}{2}\right) = V'\,b \quad \ldots\ldots\ldots\ldots (1)$$

Hence $$V' = (B + e)/b \quad \ldots\ldots\ldots\ldots (2)$$

and the increase in volume is

$$V' - 1 = \frac{B + e - b}{b} = \frac{B - b}{b} + \frac{e}{b} \quad \ldots\ldots\ldots\ldots (3)$$

Special case.—If B is the same as b, or the pressure of the outside atmosphere, then the solution becomes

$$V' = (b + e)/b = 1 + e/b, \text{ or } V' - 1 = e/b \quad \ldots\ldots\ldots (4)$$

in which e has its maximum value when the original cubic meter of vapor is saturated, but the formula and its method of demonstration hold good for any relative humidity.

Illustration.—When 1 cubic meter of saturated vapor at 10° C., for which $e = 9.14$ millimeters, is mixt with 1 cubic meter of dry air at the same temperature and atmospheric pressure of 760 millimeters, the volume of the mixture becomes

$1 + 9.14/760$ or 1.0120 cubic meters.

When 1 cubic meter of dry air at 760 millimeters becomes

completely saturated at 10° C., it expands to 1.0122 cubic meters. (See problem 18.) The difference between these two cases is seen to be very small.

Special case.—The student should solve the following: What quantity of dry air in cubic meters under 760 millimeters pressure, when mixt with the quantity of vapor necessary to saturate 1 cubic meter of space, will expand so as to occupy exactly 1 cubic meter and be saturated? Ans. $1 - e/b$ cubic meter.

Problem 22.—What is the relative humidity of the mixture considered in problem 21, and what is the vapor pressure in the special case where a cubic meter of saturated vapor is taken?

Solution.—The mixture contains only the weight of vapor necessary to saturate 1 cubic meter of space, which, by equation (2) problem 13, is

$$\frac{1293.05 \times 0.622\, e}{(1 + at)\, 760} \text{ grams of vapor} \ldots\ldots\ldots\ldots\ldots (1)$$

But by problem 21, the cubic meters of air and vapor have expanded to $(B+e)/b$ cubic meters, and this increased volume, if saturated, will contain

$$\frac{1293.05 \times 0.622\, e \times (B+e)}{(1+at)\, 760\, b} \text{ grams of vapor} \ldots\ldots\ldots (2)$$

Since relative humidity, exprest as a percentage, is 100 multiplied by the ratio of the quantity of vapor actually present, as given by (1), to the quantity of vapor the expanded volume could contain if saturated, given by (2), we have

$$\text{Relative humidity} = 100\, b/(B+e) \text{ per cent.}$$

Special case.—In a mixture under 760 millimeters pressure, of 1 cubic meter of dry air at 760 millimeters, and 1 cubic meter of saturated vapor, both at 10° C., since $e = 9.14$ millimeters, we have

$$\text{Relative humidity} = 100 \times \frac{760}{760+9.14} = 98.8 \text{ per cent.}$$

The actual vapor pressure divided by the saturation vapor pressure is the relative humidity; if this ratio is multiplied by 100, we get the relative humidity exprest as a percentage. If the relative humidity of any mixture is 50 per cent, the vapor pressure is 50/100 of saturation; it is therefore $e \times 50/100$. If the relative humidity, as above, is $100\, b/(B+e)$ per cent, the vapor pressure becomes

$$\frac{e}{100} \times \frac{100\, b}{B+e} = \frac{e\, b}{B+e}$$

In the case given, where $e = 9.14$ mm., the vapor pressure is

$$\frac{9.14 \times 760}{760+9.14} = 9.03 \text{ mm.}$$

Problem 23.—What volume will a cubic centimeter of water at temperature 4° C. (when it has its maximum density) occupy in the state of vapor at the temperature of 100° C.?

Solution.—This is a very simple application of the formula of problem 13. A cubic meter of saturated vapor at 100° C. weighs

$$\frac{0.622 \times 1293.05}{1 + (0.00367 \times 100)} \times \frac{760}{760} \text{ grams}$$

since at 100° C. the vapor pressure is 1 atmosphere, or 760 millimeters.

This reduces to 588 grams. Then if 1 cubic meter weighs 588 grams, 1 gram at 100° will occupy 1/588 cubic meter or 0.001698 cubic meter, which is 1698 cubic centimeters. One gram of water at its maximum density at 4° C. occupies 1 cubic centimeter; so 1 cubic centimeter of water at 4° C. occupies 1698 cubic centimeters when it becomes vapor at 100°. See Deschanel, page 363, part 284.

Problem 24.—To find the vapor tension, the temperature of the dew-point, the weight of the vapor and the dry air, respectively, and the relative humidity when we know the temperatures of the dry-bulb and wet-bulb thermometers.

This is best done by the use of any psychrometric table, e. g., Marvin's Tables, published by the Weather Bureau. Many examples should be worked out by these tables in order to attain proficiency and secure familiarity. The physical principles on which these tables are based are explained at pages 380–391 of Professor Ferrel's Recent Advances in Meteorology, published as Appendix 71 to the Annual Report of the Chief Signal Officer, 1885. They are also given in Section D of the Treatise on Meteorological Apparatus and Methods, published as Appendix 46 to the Annual Report of the Chief Signal Officer, 1887.

Problem 25.—How much will the air be warmed by the latent heat liberated in the formation of a certain amount of frost?

Solution.—On February 26, 1905, Mr. Seeley melted the frost and found its equivalent to be 0.018 inch in depth of water; 0.018 inch is 0.457 millimeter. Since 1 kilogram (1000 grams) on a square meter of surface is equal to 1 millimeter of water at its maximum density, i. e., at 4° C., then to obtain 0.457 millimeters of precipitation would require 457 grams on a square meter, or the 0.018 inch is equal to 457 grams per square meter.

The amount of heat liberated by the condensation of 1 gram of vapor to water at 0° C. is in round numbers 600 calories, and the freezing of 1 gram of water liberates 80 calories additional, or a total of 680 calories. Hence, 457 grams will liberate 680 × 457 or 310 760 calories.

A cubic meter of air at 0° C. and 760 millimeters weighs 1293.05 grams. The specific heat of air is 0.238; to warm 1293.05 grams of air 1° C. will require 1293 × 0.238 calories or 307.734 calories. As the precipitation liberated 310 760 calories, this is sufficient to warm up 310 760 ÷ 307.734 or 1009.8 cubic meters of air 1° C. This was solved in English measures in the MONTHLY WEATHER REVIEW, April, 1905, page 155, but the following is more accurate:

A column 1009.8 meters high above a square meter of ground becomes in English measures a column 3313.6 feet high above a square foot of ground. Hence, the heat liberated in this column will warm up its 3313.6 cubic feet of air by 1° C. or 1.8° F.; or 331 cubic feet by 18° F., or 596 cubic feet by 10° F.

[The 525 cubic feet given in the April, 1905, REVIEW undoubtedly arose from using 535.9 (more properly 536.6) as the latent heat of vaporization at 0° C. This is really the latent heat of vaporization at the boiling point, and the proper figure for the freezing point is 596.7, to which must be added 80 as the latent heat for melting ice at 0° C., making a total of 676.7. See Watson, Text Book of Physics, fourth edition, page 249. The Editor may be responsible for the error.—EDITOR.]

PROBLEMS IN MIXTURES OF AIR AND VAPOR.

[The general problems of mixtures of vapor and air are solved algebraically by the EDITOR in the following lines, to which Mr. von Herrmann has added notes and numerical examples.]

1. Let n volumes of dry air at pressure p_a, relative humidity 0, and temperature t, mix with n' volumes of aqueous vapor at pressure p_v, relative humidity r, and temperature t, forming within a rigid inclosure $n+n'$ volumes of mixture at pressure p_a' for dry air, and p_v' for vapor, and total pressure p', relative humidity r', and temperature t.

Let e be the saturation tension of the vapor for temperature t. For accurate work both p and e must be exprest in standard units, e. g., the height of a column of mercury under standard temperature and gravity. The law of Boyle states that as long as the temperature remains the same, the product

of the volume (V) of a given mass of any gas, into the pressure (P) is equal to the product of its volume (V') under any other pressure (P') into that pressure, or

$$P\,V = P'\,V' = \text{constant}.$$

The law applies approximately to aqueous vapor, and to each gas in a mixture independent of the presence of other gases.

Thus we obtain the following relations:

Partial pressures.—The total volume $(n+n')$ multiplied by the partial pressure for the dry air, p_a' must equal the original volume of dry air n, multiplied by the pressure p_a, or

$$(n + n')\,p_a' = n\,p_a \quad\text{(1)}$$

Also, the total volume $(n + n')$ multiplied by the partial pressure of the vapor p_v', must equal the original volume of the vapor n' multiplied by its pressure p_v, giving

$$(n + n')\,p_v' = n'\,p_v \quad\text{(2)}$$

Relative humidity.—Relative humidity is the ratio of the vapor tension present to the saturation tension of the vapor for temperature t, or in the case of aqueous vapor at tension p_v (saturation tension being e),

$$r = \frac{p_v}{e} \quad\text{(3)}$$

In $(n + n')$ volumes of the mixture, the vapor tension is p_v', the tension of saturation is e, therefore

$$r' = \frac{p_v'}{e} \quad\text{(4)}$$

From (2), $p_v' = n'\,p_v/(n + n')$, which substituted in (4) gives

$$r' = \frac{n'}{n + n'} \times \frac{p_v}{e} \text{ or } r' = \frac{n'}{n + n'}\,r \quad\text{(5)}$$

Total pressure.—$\quad p' = p_a' + p_v' \quad\text{(6)}$

Total mass.—$\quad (n + n')\,p' = n\,p_a + n'\,p_v \quad\text{(7)}$

2. Let the rigid inclosure be opened; the atmospheric pressure b becomes the inclosure that acts on the mixture, allowing it to form n'' volumes of mixture, at total pressure b, relative humidity r'' and temperature t. The new relations will be:

Partial pressures.—For air, since the original volume n multiplied by its pressure p_a must equal the new volume n'' multiplied by its partial pressure p_a'',

$$n\,p_a = n''\,p_a'' \text{ or } p_a'' = \left(\frac{n}{n''}\right)p_a \quad\text{(8)}$$

Similarly for vapor

$$n'\,p_v = n''\,p_v'' \text{ or } p_v'' = \left(\frac{n'}{n''}\right)p_v \quad\text{(9)}$$

Relative humidity.—Substituting the value of p_v'' from (9)

$$r'' = \frac{p_v''}{e} = \frac{n'}{n''} \times \frac{p_v}{e} = \frac{n'}{n''}\,r \quad\text{(10)}$$

Total mass.

$$n''\,b = (n+n')\,\frac{n\,p_a + n'\,p_v}{n+n'} = n\,p_a + n'\,p_v \quad\text{(11)}$$

This must evidently be true by (7) since the mass has not been changed.

Total pressure.

$$b = p_a'' + p_v'' = \frac{n}{n''}\,p_a + \frac{n'}{n''}\,p_v \quad\text{(12)}$$

Total volume.

$$n'' = \frac{n\,p_a}{b} + \frac{n'\,p_v}{b} \quad\text{(13)}$$

$$\frac{n''}{n} = \frac{p_a}{b} + \frac{n'\,p_v}{n\,b} \quad\text{(14)}$$

3. Let 1 volume of dry air be mixt with n' volumes of saturated vapor, and apply atmospheric pressure b; the above equations become as follows:

Volume of dry air, $n=1$; volume of saturated vapor, n': tension of saturated vapor $p_v = e$; relative humidity of saturated vapor is always 1; $r = 1$.

By (11) $n''\,b = p_a + n'\,e \quad\text{(15)}$

$$n'' = p_a/b + n'\,e/b = \frac{p_a}{b}\left(1 + \frac{n'\,e}{p_a}\right) \quad\text{(16)}$$

By (9) $\quad p_v'' = \left(\frac{n'}{n''}\right)p_v = \left(\frac{n'}{n''}\right)e \quad\text{(17)}$

By (10) $\quad r'' = \frac{p_v''}{e} = \frac{n'}{n''}\,r = \frac{n'}{n''} \quad\text{(18)}$

(*a*) *Numerical example.*—1 cubic meter of dry air under 600 millimeters pressure is mixt with ½ cubic meter of saturated vapor, both at temperature 10°; let atmospheric pressure (760 mm.) be applied; find volume n'', relative humidity r'', and vapor pressure p_v''.

$p_a = 600$ mm; $n' = 0.5$; $e = 9.14$ mm.; $b = 760$ mm.

$n'' = \frac{600}{760}\left(1 + \frac{0.5 \times 9.14}{600}\right)$ which is 0.795 cubic meter.

$r'' = \frac{0.5}{0.795} = 0.629$ or 62.9 per cent.

$p_v'' = 0.629 \times 9.14 = 5.75$ mm.

(*b*) If the original cubic meter of air had been under a pressure of 760 mm., the answer would have been $n'' = 1.006$ cubic meters; $r'' = 0.497$ (49.7 per cent); $p_v'' = 4.54$ mm. Check computation for relative humidity: 1 cubic meter of saturated air at 760 mm. and 10° C. contains 9.34 grams of vapor; the volume 1.006 cubic meters, if saturated would contain $9.34 \times 1.006 = 9.396$ grams. The amount of vapor added was ½ cubic meter or ½ (9.34) = 4.67 grams, hence relative humidity is $4.67/9.396 = 0.497$.

(*c*) *Numerical example.*—1 cubic meter of dry air under 760 mm. pressure is mixt with 1.012173 cubic meters of saturated vapor, both at 10° C.; atmospheric pressure 760 mm. is applied, find the volume, relative humidity, and vapor tension.

$$n'' = \frac{760}{760}\left(1 + \frac{1.012173 \times 9.14}{760}\right) = 1.012173 \text{ m}^3.$$

$r'' = 1.012173/1.012173 = 1$, or 100 per cent.

$p_v'' = 9.14 \times 1 = 9.14$ mm.

The student should interpret this result. Evidently we have added to the original cubic meter of dry air just the quantity of vapor necessary to saturate the whole mass of air at its increased volume, in which case the relative humidity becomes 100 per cent, or the vapor tension is the same as the vapor tension for saturation.

(*d*) Interpret the result when more than 1.012173 cubic meters of vapor are added to 1 cubic meter of dry air both at the same pressure and temperature. Evidently more vapor has been added than is capable, under the conditions, of existing as vapor, and the excess must be condensed to water.

(*e*) If, in the first numerical example, the cubic meter of air is under a pressure of 375.43 mm., interpret the result.

Under 760 mm. the volume of air reduces to such volume that the quantity of vapor supplied just saturates it. Therefore the pressure of the original cubic meter of air can not be assumed less than 375.43 mm. at 10° C.

4. Let 1 volume of dry air, pressure p_a, be mixt with 1 volume of saturated vapor, pressure p_v, under the total atmospheric pressure b; we have the following relations:

$$n = 1;\ n' = 1;\ p_v = e;\ r = 1 \quad\text{(19)}$$

$$n'' = \frac{p_a}{b}\left(1 + \frac{e}{p_a}\right) = \frac{p_a + e}{b} \quad\text{(20)}$$

$$p_v'' = \frac{1}{n''}\,e = \frac{b}{p_a + e} \times e \quad\text{(21)}$$

$$r'' = \frac{p_v''}{e} = \frac{1}{n''} = \frac{b}{p_a + e} \quad\text{(22)}$$

5. Let p_a be the same as the total atmospheric pressure b, then equations (20) and (22) become

$$n'' = 1 + e/b; \text{ and } r'' = b/(b+e) \quad \ldots\ldots (23)$$

Numerical example.—1 cubic meter of dry air under 755 mm. pressure is mixt with 1 cubic meter of saturated vapor, both at 10° C.; find the volume, humidity, etc., under the total pressure of 760 mm. $n = 1$; $n' = 1$; $p_v = e = 9.14$; $p_a = 755$; $b = 760$

$$n'' = \frac{755 + 9.14}{760} = 1.005 \text{ cubic meter.}$$

$$r'' = 1/1.005 = 0.9945 \text{ or } 99.45 \text{ per cent.}$$

NOTE.—If in this case we had assumed the original dry air pressure to be less than 750.86 mm., the resulting n'' would have been less and the r'' greater than 1. This means that some of the vapor must condense to water on or within the inclosure, so that the total mass of vapor and air is diminished, a condition not contemplated or provided for in the original problem.

Numerical example.—Find the volume and relative humidity of a mixture of 1 cubic meter of dry air under 760 mm., and 1 cubic meter of saturated vapor, both at 10° C. ($e = 9.14$); this mixture also to be under atmospheric pressure ($b = 760$.)

$$n'' = 1 + 9.14/760 = 1.01203 \text{ cubic meters.}$$

$$r'' = 760/769.14 = 0.988 \text{ or } 98.8 \text{ per cent.}$$

$$p_v'' = 0.988 \times 9.14 = 9.03 \text{ mm.}$$

If the temperature be 30° C., $e = 32.51$, $n'' = 1.04276$; relative humidity 95.9 per cent.

If the temperature be 0° C., $e = 4.60$, $n'' = 1.00605$; relative humidity 99.4 per cent,

The lower the temperature the closer the final volume approximates 1 and the relative humidity 100 per cent.

6. If we consider only 1 volume of the mixture, at the total pressure b, the general equations of articles 1 and 2 hold good for the mixture, but we must put $n'' = 1$.

7. What volume, n, of dry air, at pressure p_a and relative humidity 0, and what volume, n', of vapor, at tension p_v and relative humidity r, at the temperature t, for which e is the saturation tension, must be mixt in order to obtain 1 volume of saturated mixture at the pressure b?

For the saturated mixture $n'' = 1, r'' = 1$. Therefore the general equations of article 2 become

$$\text{By (10) } r'' = \frac{n'}{n''} r = n' r = p_v''/e = n' p_v/e = 1 \quad \ldots\ldots (24)$$

$$\text{Therefore } p_v'' = n' p_v = e \quad \ldots\ldots (25)$$

$$\text{and } n' = \frac{e}{p_v} \quad \ldots\ldots (26)$$

Since the dry air is at the pressure $(b - e)$ in the saturated mixture, therefore by (8)

$$p_a'' = \frac{n}{n''} p_a = np_a = (b - e) \quad \ldots\ldots (27)$$

$$\text{Equation (13), } n'' = \frac{np_a}{b} + \frac{n'p_v}{b}, \text{ becomes } 1 = \frac{np_a}{b} + \frac{n'p_v}{b} \quad ..(28)$$

$$n = \frac{b}{p_a} - \frac{n'p_v}{p_a} \quad \ldots\ldots (29)$$

In this substitute for n' its value ($n' = e/p_v$) and we obtain:

$$n = \frac{b}{p_a} - \frac{e}{p_a} = \frac{(b-e)}{p_a} \quad \ldots\ldots (30)$$

Since p_a, p_v, r and b are known, the values of n and n' are found from the equations

$$n' = e/p_v \quad \ldots\ldots (31)$$

and

$$n = (b - e)/p_a \quad \ldots\ldots (32)$$

Numerical example.—An unknown volume (n) of dry air at 760 millimeters is mixt with 1 volume of saturated vapor, both at 10° C., and the final mixture is found to consist of 1 cubic meter of saturated air at 760 millimeters. What was the original volume (n) of dry air?

$$n'' = 1; \; n' = 1; \; p_a = 760; \; p_v = e = 9.14 \text{ mm}; \; b = 760$$

$$\text{By (28) } n'' = \frac{np_a + n'p_v}{b}; \text{ or } 1 = \frac{nb + e}{b}.$$

$$\text{Therefore, } n = 1 - e/b \quad \ldots\ldots (33)$$

That is, $n = 1 - 9.14/760$ or 0.98797 cubic meters.

If $t = -20°$ C. n is 0.99893
$t = -10°$ C. n is 0.99737
$t = 0°$ C. n is 0.99395
$t = 10°$ C. n is 0.98797
$t = 30°$ C. n is 0.95722

The student should interpret the result when the temperature is 100° C. At 100° C. the vapor pressure for saturation is 760 millimeters, and hence a cubic meter of vapor at that temperature can contain no air when $b = 760$ mm.

Numerical example.—What volume of dry air at 760 millimeters, and what volume of vapor at a tension 4.57 millimeters (i. e., R. H. 50 per cent), both at temperature 10° C., must be mixt in order to obtain one volume of saturated mixture?

Answer.—$n' = 9.14/4.57 = 2$ cubic meters of vapor;
$n = (760 - 9.14)/760 = 0.98797$ cubic meter of dry air.

8. Let n volumes of dry air at pressure p_a and n' volumes of saturated vapor ($p_v = e$) be mixt to make 1 volume of saturated mixture at the pressure b, then by article 7, equations (31) and (32),

$n' = e/e = 1$ volume of vapor at tension $p_v = e$ ......(34)
$n = (b - e)/p_a$ volumes of dry air at pressure p_a ......(35)

Hence, for the total mixture equation (11) becomes

$$1\, b = np_a + n'e = \frac{b-e}{p_a} p_a + 1\, e \quad \ldots\ldots (36)$$

and the two terms reduce to the identity $b = b$.

Numerical examples.—(*a*) Let n volumes of dry air under 600 millimeters at 10° C. be mixt with n' volumes of saturated vapor at 10° C. ($p_v = e = 9.14$ millimeters) to make 1 volume of saturated mixture under 760 millimeters; then

$n' = e/e = 9.14/9.14 = 1$ volume of vapor.
$n = (760 - 9.14)/600 = 1.25143$ volumes of dry air.

Air at	760	millimeters,	required volume	0.98797
"	600	"	"	1.25143
"	500	"	"	1.50175
"	400	"	"	1.87715
"	300	"	"	2.5029
"	200	"	"	3.7543
"	100	"	"	7.5086

(*b*) Let n volumes of dry air under 600 millimeters at 10° C. be mixt with n' volumes of vapor under tension of 4.57 millimeters (i. e., R. H. 0.5, or 50 per cent) to make 1 volume of a saturated mixture under 760 millimeters; then

$n' = 9.14/4.57 = 2$ volumes of vapor.
$n = (760 - 9.14)/600 = 1.25143$ volumes of air,

twice the volume of vapor but the same volume of air as in the example just preceding.

9. Let n volumes of dry air be mixt with n' volumes of moist air, having the relative humidity r', both being at the same temperature t and pressure of 760 millimeters. Some of the vapor in n' will diffuse into the dry air of n, and some of the dry air will pass from n over to n', until eventually each gas comes into static equilibrium by itself, independently of the other. According to Dalton's Law, the following relations will hold good in the mixture:

$$n'' = n + n' \quad \text{(37)}$$

$$r'' = \frac{n'}{n + n'} r' = \frac{n'}{n''} r' \quad \text{(38)}$$

$$p_v'' = \frac{n'}{n + n'} r' e = r'' e \quad \text{(39)}$$

$$p_a'' + p_v'' = 760 \quad \text{(40)}$$

$$p_a'' = 760 - p_v'' \quad \text{(41)}$$

10. Let n' volumes of air having the relative humidity r' be mixt with n'' volumes of air having the relative humidity r'', both being at the same temperature t and pressure 760 millimeters. If the total pressure continues the same, then the new volume and relative humidity are given by the following equations:

$$n''' = n' + n'' \quad \text{(42)}$$

$$r''' = \frac{n' r' + n'' r''}{n' + n''} \quad \text{(43)}$$

$$p_v''' = r''' e \quad \text{(44)}$$

$$b = p''' = p_a''' + p_v''' = 760 \quad \text{(45)}$$

$$p_a''' = 760 - p_v''' \quad \text{(46)}$$

Numerical examples.—1. If 1 cubic meter of dry air be mixt with 5 cubic meters of air having a relative humidity of 100 per cent, the mixture will consist of 6 cubic meters of moist air having a relative humidity of 83.33 per cent.

2. If 3 volumes of dry air be mixt with 5 volumes of air having a relative humidity of 50 per cent, the mixture will consist of 8 volumes of moist air having a relative humidity of 31.25 per cent.

3. If 3 volumes of air, relative humidity 25 per cent, be mixt with 5 volumes of air, relative humidity 75 per cent, the mixture will consist of 8 volumes of air having a relative humidity of 56.25 per cent.

11. Let n' volumes of air having relative humidity r' and total pressure p' be mixt with n'' volumes of air having relative humidity r'' and total pressure p''; let both have the same temperature t, and let the combined volumes be brought under pressure 760 millimeters and kept at the same temperature. The following equations will give the new volume and humidity:

$$p' = p_a' + p_v' \quad \text{(47)}$$

$$p_v' = r' e \quad \text{(48)}$$

$$p_a' = p' - r' e \quad \text{(49)}$$

$$p'' = p_a'' + p_v'' \quad \text{(50)}$$

$$p_v'' = r'' e \quad \text{(51)}$$

$$p_a'' = p'' - r'' e \quad \text{(52)}$$

$$n''' = \frac{n' p' + n'' p''}{760} \quad \text{(53)}$$

$$r''' = \frac{n' r' + n'' r''}{n'''} \quad \text{(54)}$$

$$p_v''' = r''' e \quad \text{(55)}$$

$$p_a''' = \frac{n' p_a' + n'' p_a''}{n'''} \quad \text{(56)}$$

$$760 = p_a''' + p_v''' \quad \text{(57)}$$

Numerical example.—If 2 volumes of air, relative humidity 50 per cent, under a pressure of 380 millimeters, be mixt with 5 volumes of air, relative humidity 25 per cent, under 500 millimeters pressure, the mixture under atmospheric pressure will consist of 4.29 volumes of moist air with a relative humidity of 52.45 per cent, under 760 millimeters.

THE GROWTH OF FOG IN UNSATURATED AIR.

By FRANK W. PROCTOR. Dated Fairhaven, Mass., November 8, 1906.

During the summers of 1901 and 1902 the writer made terdaily observations of temperature, moisture, barometric pressure, wind direction and velocity, and the occurrence of fog at all hours, except during sleep, for the purpose of studying the origin of the summer fogs that are tolerably frequent on the south shore of Massachusetts, and that are seemingly capricious in their occurrence and endurance. Those observations, so far as they bore on the locus and the proximate cause of formation, and on the manner of advent, of the summer fogs of sufficient density to be called "fog" in the ordinary sense of the term, are discust in the MONTHLY WEATHER REVIEW for October, 1903.[1]

The observations (whose details will not be repeated here), also showed that over Buzzards Bay there existed almost continuously a haze which was deemed to be an aqueous haze, because it could usually be seen when the wind blew from the sea, because it graded so insensibly into the fogs ordinarily so-called that it was impossible to distinguish a thick haze from a light fog, and because the air was so completely cleared of the haze by anticyclones. This haze was observed with a wind from the south, and a relative humidity as low as 52 per cent determined with a sling psychrometer; and in the paper mentioned it was suggested that "the persistent aqueous haze over the bay with winds from seaward, seems to indicate not only that the saturation temperature is different for different kinds of nuclei, but also that under ordinary conditions the variety of suitable nuclei is large enough to make condensation a gradual process rather than a catastrophe at a certain critical vapor pressure".

The following summer a new series of observations was begun for the purpose of trying to correlate the growth of this haze with other weather conditions and changes. But it was found at the outset that as soon as the air was cleared of visible particles by a passing anticyclone, they formed again with astonishing rapidity under all conditions of weather by day and by night; and the observations were thereupon discontinued, with the only further result that it was seen that the haze, like other forms of fog, has a diurnal period, being denser at night when the temperature is lower.

The purpose of this article is to consider whether current theory and laboratory experiments furnish any confirmation or explanation of the apparently observed beginning of visible fog condensation in air far below normal saturation,[2] and its gradual growth with increasing vapor pressure into the ordinary, dense, atmospheric fog.

Long ago Lord Kelvin showed that a drop of pure water will evaporate in the presence of water vapor that is saturated with respect to a flat surface. This evaporation is due to the increased internal energy of the drop caused by the pressure of surface tension. The surface tension energy per unit area of a liquid surface is the same for flat and curved surfaces; but the tension of the curved surface around a drop of the liquid squeezes the drop and thus increases its internal energy. On drops of pure water of the ordinary sizes, owing to the changing curvature of the surface, the pressure due to surface tension increases as the radius of the drop diminishes. Since a drop of pure water will evaporate in a vapor just saturated, of course no drop can maintain its integrity unless the vapor has a degree of supersaturation precisely suited to the size of the drop. Any slight variation of the amount of moisture will make the drop either grow and fall as rain, or evaporate and disappear.

So there can be no gradual growth of fog from small vapor pressures. Any possible fog will appear suddenly when the appropriate supersaturation is reached, and it will necessarily be transitory. Practically, then, there can be no atmospheric fog of pure water droplets.

[1] A study of the summer fogs of Buzzards Bay, Vol. XXXI, p. 467.

[2] The terms "saturation" and "normal saturation" are used thruout in the sense of saturation for flat surfaces, or the degree of saturation in which the wet and dry bulbs of a sling psychrometer read alike. The terms "saturated" and "undersaturated" refer to this standard. The reasons for the distinction will appear.

Aitken showed that this obstacle to the condensation of water drops in saturated vapor is overcome by dust particles in the air, which serve to increase the radius of the drop and thereby give a flatter water surface; and C. T. R. Wilson discovered that the ionization of air also supplies nuclei that encourage condensation.

The presence of solid dust particles, tho furnishing a nucleus that permits condensation at a lower vapor pressure than in dust-free vapor, does not alter the condition of unstable equilibrium that characterizes the ideal droplet of pure water, and apparently, therefore, solid dust particles can not make a stable fog possible.

The theoretical behavior of a drop of water that carries a charge of electricity is curious and interesting. J. J. Thomson has shown that the presence of an electric charge on a drop of water tends to prevent evaporation, and when the drop is very small will neutralize the effect of the surface-tension pressure, which tends to promote evaporation. With the charge deduced from an artificial laboratory cloud, he computed that such a drop has a radius 10^{-8} cm.—not much larger than the molecules of water.[3]

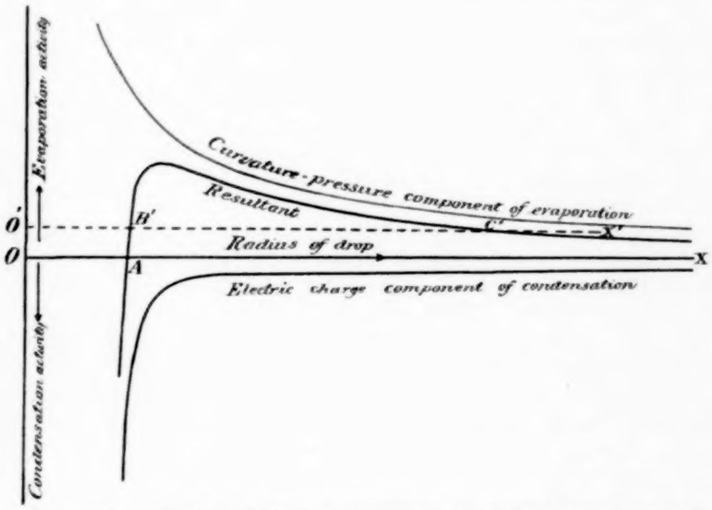

FIG. 1.—The effects of surface curvature and electric charge upon the condensation and evaporation of drops of water.

The accompanying diagram, fig. 1, which is inserted solely for illustrative purposes, not to indicate actual values, shows the general character of the separate and combined effects of an electric charge and the pressure of curvature due to surface tension, on the condensation and evaporation of drops of water of variable size, in vapor just saturated for a flat surface, temperature being constant, on the assumption that the surface tension of uncharged drops of pure water per unit area is constant for all sizes of droplets, and that none of the charge escapes. In this figure the effect of the charge has been enormously exaggerated in order to get a suitable curve for plotting, but in general it follows the equations given by C. T. R. Wilson, Smithsonian Report 1904, p. 198.

The pressure of the external saturated vapor just offsets the vapor pressure at a flat, uncharged surface. These two evaporation and condensation factors thus just balance each other and they may therefore be ignored in tracing the opposing effects of the charge (lower curve) and of the surface curvature (upper curve) upon condensation and evaporation at the surface of the drops. The middle curve, which is the resultant of the other two curves, shows the effective excess of evaporation or condensation. The portion of this curve lying above the axis $O\ X$ indicates evaporation, the part below indicates condensation. The intersection of the curve with $O\ X$ at A indicates the size of the charged drop at whose surface the vapor pressure is in equilibrium with the external saturated vapor. For drops of varying sizes, the curves show the changing conditions with respect to these evaporation and condensation factors, and with respect to their resultants.

Starting at the right of the diagram with a saturated vapor for the flat surface and a large, charged drop with small curvature, let the contending effects of the charge and of the pressure due to surface tension be followed as the radius of the drop is supposed to be arbitrarily and gradually diminished, the temperature and vapor pressure remaining constant. At the start the charge reduces the internal energy of the liquid, but not sufficiently to overcome the increase of internal energy due to curvature pressure, so that now the drop would evaporate in the vapor just saturated for a flat, uncharged surface. For drops successively smaller the surface-tension pressure (the evaporation factor) by reason of the shortening radius of curvature, will increase at a slowly growing rate. Owing to the concentration of the constant charge on the smaller surface, the effect of the charge (the condensation factor) will also increase. Its rate of growth will be an increasing rate, which at first will be slower than the rate of growth of the evaporation factor; but finally with smaller and smaller drops the rate of growth of the condensation factor will become the larger of the two.

It accordingly results, as the radius of the drop is supposed to be reduced, that for a while, as the drop diminishes in size, the evaporation factor will predominate and will grow faster than the condensation factor; but eventually its excess of influence will reach a maximum value, owing to the increasing rate of growth of the efficiency of the charge, and thenceforth this excess of evaporation efficiency will gradually decline as the influence of the charge continues to increase at a faster and faster rate, until both influences become equal. This is a critical point in the size of the drop. The drop is in equilibrium with its vapor and the equilibrium is stable, for it is seen that smaller drops will condense and grow to this critical size, because from this point downward, with shorter radii, the condensation factor will be dominant. Larger drops will evaporate down to this critical size by reason of the greater influence of the surface-tension pressure. This size is stable for the given vapor pressure only, viz, saturation for a flat surface. For this vapor pressure there can be no gradual growth of drops of larger radius than A, a very small droplet; and consequently there can be no rain unless raindrops can in some way be created at once of full size.

For other vapor pressures the critical size of the drops will have other values, depending upon the amount of the vapor pressure. For higher pressures stable-equilibrium size will be larger, for lower pressures stable-equilibrium size will be smaller. Any increase of vapor pressure will augment the condensation activity and the resultant curve will thereby be lowered with respect to the axis $O\ X$, or what comes to the same thing, $O\ X$ will be raised as indicated by the broken line $O'\ X'$. For lower vapor pressures the condensation activity will be diminished and the resultant curve will be raised or the axis lowered.

If the axis $O\ X$ be raised to suit a higher vapor pressure, as is indicated by the broken line, it will cut the resultant curve in two places, and the intersection at C' indicates a second critical size of the drop. It is again in equilibrium with the surrounding vapor. The drop will neither grow by condensation nor diminish by evaporation as long as the vapor remains at this pressure. But the equilibrium is unstable—any slight variation of the vapor pressure will destroy it; larger drops will grow continuously until precipitated, while smaller drops will evaporate down to stable equilibrium size at B'.

If the vapor pressure be further increased the dotted axis

[3] The discharge of electricity through gases, p. 15.

will cut the resultant curve still higher. The region of no growth between B' and C' will be shortened and the region of potential growth will be extended. If the vapor pressure continues to increase, the points of intersection will approach each other and finally meet at the highest point of the resultant curve. Henceforth drops of all sizes will be unstable and will grow until precipitated.

Apparently reduction of the size of the drop can go on without limit, the drop being successively in stable equilibrium with smaller and smaller vapor pressures until the range of molecular attraction is reached. There the surface tension becomes smaller and below this point the equilibrium will be unstable. There will be no further increase of the evaporating force with diminishing radius of the drop; and in any vapor pressure drops of smaller size will grow up to the size where molecular attraction has full range.

At some point in this descending scale used for illustration the drop becomes so small as to be invisible, viz, when it is too small to scatter the violet rays of light. Whether this point will be reached depends upon the amount of the electric charge. As has been seen, the smaller the charge the smaller the drop must be in order to be in equilibrium with a given vapor pressure. If the charge is the ionic charge there is a limit to its amount[4], and it may be so small that when equilibrium for flat-surface saturation is reached the drops are too small to make a visible haze.

Tho drops rendered stable by electric charge in vapor just saturated for a flat surface, and of course also in unsaturated vapor, may be too small to make a visible haze, any such minute, stable, invisible droplets will serve as nuclei for condensation, and will grow whenever the vapor pressure is increased by any small increment whatsoever.

If the charge on a drop is sufficiently increased, stable equilibrium will be reached in unsaturated vapor with drops large enough to be visible.[5] Dissolved matter in a drop reduces the internal energy of the drop, and thus has a similar effect to that of an electric charge in promoting condensation. In the case of drops of very dilute solutions the evaporating influence of the pressure of curvature is the stronger, but as a drop becomes more concentrated by evaporation to a smaller diameter, the influence of the dissolved substance grows faster than the effect of the surface-tension pressure. Eventually the two influences become equal, and stable equilibrium is reached for the given vapor pressure. For smaller drops and more concentrated solutions condensation will take place. Prof. Carl Barus has constructed the curve showing these relations.[6]

There is no such limit to the amount of matter that may be in solution in a drop under ordinary atmospheric conditions, as there is to the amount of the electric charge on a drop; and in strong solutions the drops that attain stable equilibrium are larger than those that carry the ionic charge of electricity. If the solution be sufficiently concentrated, the stable size of drops will be reached (in the descending scale used for illustration) while the drops are large enough to make a cloud that is readily visible. For varying humidities the solution must increase in concentration as the vapor pressure diminishes in order that the drops may be visible. In the formation and growth of atmospheric fog condensation is probably promoted by the joint influence of dissolved substances and ionization.

Let the behavior of a drop be considered as it grows in the atmosphere from small beginnings in a low vapor pressure.

There is always some vapor in the atmosphere, and minute drops having an electric charge, and drops of solutions, both charged and uncharged, never completely evaporate owing to the effect of the charge, the density of the solution, and the low pressure of the vapor. Such droplets, according to Barus, are "nuclei" of condensation.[7] As seen above, their size depends upon the vapor pressure and upon the intensity of the charge or the amount of the dissolved substance. Drops having a small amount of matter in solution will have to evaporate to a very small size in order to become sufficiently concentrated to resist further evaporation. Those with larger amounts of the dissolved substance will make larger drops sufficiently concentrated to be in equilibrium for any given vapor pressure: so at any time there are in the atmosphere stable drops of various sizes, depending upon the amount of the substances in solution. The maximum size of drops that can be in stable equilibrium in vapor much below normal saturation will thus be limited only by the amount of foreign matter that can be captured by a drop. At low atmospheric vapor pressures the fog or haze will be tenuous owing to the small number of the particles, and it may be invisible because the particles are too few and too small to scatter even the violet rays of light.

If now the vapor pressure increases, the drops will all grow by condensation until the effect of the pressure of curvature again just balances the diminishing effect of condensation due to dilution of the solution. With sufficient increase of vapor pressure, the nuclei will grow in size and number enough to make the air turbid, and thus there will be a gradually increasing density of the fog-haze, as the vapor pressure increases. In its early stage the haze will be bluish or smoky, because most of the particles are large enough to scatter only short waves of violet light. The most concentrated drops sooner arrive by growth at the stage of unstable equilibrium, where the evaporation factor of curvature-pressure can no longer offset the condensation factor due to the dissolved substance and the charge; and such drops continue to grow to precipitation size without any further increase of vapor pressure, and fall out of the fog cloud. Probably they fall so slowly as not to be ordinarily noticed. By this sifting out of the unstable drops the fog cloud remains composed mainly of the stable drops, and has a good degree of permanency as long as the increase of vapor pressure is tolerably gradual.

With solutions the question of stability or saturation in any vapor pressure is therefore apparently only a question of the density of the solution, in addition to the small charge, if any, due to ionization.

Thus there seems to be a sufficient basis for explaining the observed haze on the hypothesis that it is in fact nascent fog, perceptible in unsaturated air, provided there is reason to believe that there is enough soluble material in the air to give the droplets the required concentration of solution. There is probably no difficulty on this score. More or less of the solid dust particles in the air contain soluble material. The spray from the splashing of the sea waves, and particularly from the breaking of the waves in shallow water and in the surf, is continually supplying to the air drops of water containing various salts, which evaporate down to the stable size for the existing vapor pressure, and remain stable and persistent for long periods, becoming larger and smaller as the vapor pres-

[4] According to the English investigators of cloudy condensation, when there is a charge on a fog droplet it is the atomic charge and so is constant in amount. But Barus has found, on increasing the intensity of ionization of moist air by bringing the ionizing agent nearer the fog chamber, or by a longer exposure, that not only the number of the nuclei increases but also their size. He is of the opinion that the effect of ionization of moist air is to unite the minute permanent nuclei of the air into larger nuclei. Science, February 17, 1905, p. 275; April 14, 1905, p. 562.

The formation of such larger, stable nuclei by intense ionization suggests the possibility of the existence of a charge on a nucleus droplet larger than the charge for a gaseous ion.

[5] Fog droplets are usually too small to be visible as individual objects. They become perceptible when they are sufficiently large and numerous to scatter enough rays of light to make a visible haze.

[6] The structure of the nucleus, p. 135.

[7] Ibid., pp. 132, 135.

sure fluctuates; and these nuclei or fundamental droplets undoubtedly often coalesce and thus increase the amount of substance in solution in such drops, so that they are of various degrees of salinity. It will also be seen later that there are other sources from which fog drops obtain soluble material.

Artificial fogs have been studied for a long time in laboratories, by means of moist air in chambers in which the air can be suddenly cooled by partial exhaustion, for the purpose of discovering the relations of foreign nuclei to aqueous condensation, notably by Tyndall, Aitken, and C. T. R. Wilson, in England, by Barus, in America, and by other eminent physicists in Europe. In nearly all of the experiments it has been found necessary to expand the air 1.25 times its original volume in order to produce visible condensation. This expansion corresponded to about a fourfold supersaturation. Accordingly in the tolerably abundant literature on the subject, the condensation of the supersaturated aqueous vapor both in the laboratory and in the free atmosphere is often discust tho little mention is made of condensation in undersaturated vapor.

During some lectures at Princeton University in 1896,[8] J. J. Thomson said: "Mr. Townsend has discovered that electrified gas possesses the remarkable property of producing a fog when admitted into a vessel containing aqueous vapor. This fog is produced even tho the vessel is far from being saturated with moisture, and does not require any lowering of temperature such as would be produced by the sudden expansion of the gas in the vessel in which the fog is produced".

Townsend himself says: "When these charged gases [oxygen and hydrogen] get into the atmosphere of the room they condense the moisture and form a stable cloud in an unsaturated atmosphere".[9]

A cloud made by bubbling the charged oxygen from a sulphuric acid electrolyte thru water, and collected in a glass vessel, was dense enough to show subsidence of the cloud by photographs taken three minutes apart.[10]

According to C. T. R. Wilson, later experiments by H. A. Wilson show that it is probable that the condensation of these fogs was not due to the charge but to the presence of some substance in solution.[11]

To whatever cause the fog clouds were due, the important point to be noted here is that visible fog clouds were formed in ordinary, unsaturated air. The gases were formed and charged by the decomposition of dilute sulphuric acid and caustic potash solutions, by an electric current. On being bubbled thru water, or even on escaping into the moist air of the room, a cloud was formed.

C. T. R. Wilson found that under suitable illumination, visible fog was produced in laboratory exhaustion chambers, under the influence of strong ultraviolet light, in unsaturated air.[12] The source of this light was sparks produced between zinc terminals by an induction coil. The light entered the exhaustion chamber thru a quartz lens, which concentrated the rays; and it was therefore much stronger in ultraviolet rays than sunlight that has past thru the atmosphere, which scatters and filters out these rays in large degree. With weak ultraviolet rays, and with a concentrated beam of sunlight, no fog was visible in undersaturated air.[13]

Professor Barus has especially investigated the condensation of efficiency of nuclei produced by the violent agitation of solutions in a closed vessel from which the air could be partially exhausted, and the remaining air and vapor be thereby cooled. In sundry experiments the normal barometric pressure was reduced by 4 to 76 centimeters in order to produce visible fog;[14] and Professor Barus makes no mention of seeing fogs in undersaturated vapor, tho in a few instances "spontaneous condensation" in air, just saturated and not expanded, are recorded.[15] He found that the number and size of the "shaken" nuclei increase with increasing concentration of the solution in the drop.[16]

According to C. T. R. Wilson, the effect of the action of ultraviolet light upon moist air is to oxygenate the water and form hydrogen peroxide, which is soluble in the drop; and the amount of peroxide thus formed depends upon the intensity of the light and the time of action.[17] And Barus suggests "that such chemically powerful agencies as the X rays or Becquerel rays, or ultraviolet light, or the electric glow, etc., on being past thru a saturated vapor, produce in that vapor a new chemical synthesis, * * * soluble in the liquid from which the vapor arises".[18] These are the additional sources of soluble foreign matter above referred to, by means of which condensation may be expected in undersaturated water vapor.

Both of these physicists find that atmospheric nuclei usually carry an electric charge tho no ionizing agent be used in the experiments, and they attribute the charge to self-ionization. The general occurrence of radio-active matter in the air and on the surface of the earth, found by Rutherford and others, would perhaps account for this moderate ionization.

No intimation has been found in the papers of either Wilson or Barus that condensation does in fact occur in the undersaturated, free atmosphere under normal conditions; and there is much in the papers of Wilson to indicate the contrary opinion. For example, he makes the amount of supersaturation required for condensation in the laboratory a basis for the classification of different kinds of nuclei; and running all thru his principal papers on the subject there seems to be a tacit assumption that the results obtained in the laboratory hold true for the free air outside. The following are typical statements:

"They [ions] do not act as centers of condensation unless the vapor is about 4.2 times as dense as that in equilibrium over a flat surface of water at the same temperature".[19]

"There is, I think, no evidence that the ions alone, in the absence of other influences, ever act as centers of condensation unless the above-mentioned comparatively great degree of supersaturation (approximately fourfold) being exceeded".[20]

"The nuclei which, when they are only exposed to very weak [artificial] ultraviolet light, do not grow beyond the stage at which a fourfold supersaturation is required to make condensation take place upon them, etc".[21]

Perhaps these unqualified expressions refer only to laboratory fogs, but it is nowhere explicitly so stated.

Wilson also experimented with sunlight as a cause of condensation in the laboratory fog chambers. A quartz window was used so as not to exclude the ultraviolet rays, and the window was lens-shaped so as to concentrate the beam and give increased nucleating and illuminating effect to the rays. No condensation was produced in either saturated or undersaturated, filtered air.

On the other hand, there is much in Wilson's papers to warrant the inference that condensation of undersaturated vapor in the free air is possible. In general he seems to use the terms "nuclei" and "fog particles" as interchangeable, and as differing only in degree. In a paper presented at the International Electrical Congress at St. Louis in 1904,[22] Wilson says

[8] The discharge of electricity through gases, p. 11.
[9] Camb. Phil. Soc. Proceed., vol. 9, p. 249.
[10] Ibid., p. 351.
[11] Phil. Trans. Roy. Soc. Lond., 192, p. 452.
[12] Phil. Trans., 192, pp. 419, 423.
[13] Phil. Trans., 192, p. 430.

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[14] The structure of the nucleus, pp. 33 *et seq.*
[15] Ibid., p. 33.
[16] Ibid., p. 132.
[17] Phil. Trans., p. 192, pp. 428, 450.
[18] The structure of the nucleus, p. 135.
[19] Phil. Trans., 192, p. 451.
[20] Ibid., p. 453.
[21] Ibid., p. 420.
[22] Reprinted in Smithsonian Institution Report, 1904, p. 195.

in speaking of the "dust" particles of the atmosphere: "It would be difficult to find a means of determining whether they consist of solid particles or of minute drops of liquid".

Elsewhere he says: "For we may suppose such nuclei [charged nuclei] to be very small drops of water, which are able to persist in spite of their small size, because the effect of the curvature of the surface in raising the equilibrium vapor pressure is balanced by the opposite effect produced by the drop either being charged with electricity or containing some substance in solution. An increase in the charge of electricity, or of the quantity of dissolved substance, either of which would increase the efficiency of the drop as a condensation nucleus, would also result in an immediate increase in the size of the nucleus necessary for equilibrium".[23]

"The cloud or nuclei-producing effect of ultraviolet light rays obviously has bearings on other meteorological phenomena. The nuclei which enable clouds to form may in many cases arise from this source. The upper clouds may especially owe their formation in this way to the action of sunlight. It is possible too, that owing to the action of the ultraviolet rays, sunlight may cause clouds to persist in undersaturated air".[24]

"Altho in these sunlight experiments no nuclei, requiring only slight supersaturation to make condensation take place on them, have been produced, they do not absolutely prove that such nuclei may not be formed by sunlight even in the lower layers of the atmosphere. For it is quite possible that the disappearance of the nuclei produced by weak ultraviolet light when they are left to themselves, is entirely due to the fact that they very quickly reach the walls of the vessel by diffusion on account of their small size".[25]

Prof. J. S. Townsend said in one of his papers: "The clouds which are formed by electrified gases are perfectly stable even in an unsaturated atmosphere, and in this respect bear a close resemblance to atmospheric clouds".[26]

Tho there is little or no definite statement in the papers above mentioned concerning the probability of the condensation of fog under natural conditions in the lower atmosphere at relative humidities below 100 per cent for flat surfaces, the general tenor of these papers seems to warrant an inference that such may be the fact.

Barus points out that equilibrium vapor pressure is variable for drops of different sizes and for drops of the same size having different amounts of foreign matter in solution;[27] and Wilson shows that in theory this is true of drops having an electric charge as well as of drops containing matter in solution.[28]

Both of these physicists regard minute water droplets as "dust" nuclei, normally present in the atmosphere at all ordinary degrees of humidity; and since these minute water drops grow to precipitation size in the free air when the increase of vapor pressure is gradual, it seems to follow necessarily that condensation occurs under all these varying conditions of undersaturation for flat surfaces.

If, in fact, fog does grow gradually in the atmosphere, beginning to be visible with relative humidities as low as 52 per cent, as the observations under discussion apparently show, the question at once arises why it has not been seen in unsaturated air in the laboratory fog chambers, save in gases formed by electrolysis, and in case of the action of stronger ultraviolet light than is found in the lower atmosphere; and particularly why it has not been seen in the fog chambers of Professor Barus, in undersaturated air containing highly concentrated solution nuclei.

[23] Phil. Trans., 192, p. 404.
[24] Ibid., p. 431.
[25] Phil. Trans., 192, p. 431.
[26] Cambridge Phil. Soc. Proceed., vol. 9, p. 257 (1897).
[27] The structure of the nucleus, p. 132.
[28] St. Louis address.

Two reasons suggest themselves: (1) In those experiments the air was filtered thru closely packed cotton, and this would remove nuclei or droplets of any considerable size, which otherwise perhaps might have been seen in unsaturated air if they were numerous enough. (2) But the small size of the fog chambers gives a more probable reason why laboratory fogs have not been seen in unsaturated air. These chambers do not contain enough particles of the tenuous fogs that condense in the unsaturated outdoor air to make a visible haze. Wilson's fog chambers were tubes of 1.6 centimeter to 4 centimeters diameter, which in observing fogs were looked at transversely. It is not surprising that fog particles so far apart that an air column 11 miles[29] long is necessary to contain a sufficient number of particles in the line of sight, to scatter and reflect enough light to make a barely visible faint haze, could not do this in a column only five-eighths of an inch to one and one-half inches long. It might require several such diminutive columns to cover the distance between two fog particles. And furthermore, as Wilson points out, there is little time for fog particles to grow in such small tubes before they would reach the walls by diffusion and be lost.

In the experiments of Professor Barus the conditions were somewhat different. His fog chambers were globular and larger, from 23 to 33 centimeters in diameter, but yet very small in cross section as compared with the 11-mile air section of the outdoor observations in question. Furthermore his fog particles were not observed directly, but by means of the diffraction coronas produced by a beam of light upon the droplets—that is to say, the expansions were such as were required to produce the coronas.

He states that the particles must be numerous enough to lie not more than two millimeters apart, in order to make normal coronas in these chambers.

Such incipient fog hazes as were seen by me to form and grow over Buzzards Bay in undersaturated, outdoor air, are too tenuous to cause coronas in such small fog chambers—the particles are too far apart. Barus specifically calls attention to the fact that in his experiments the amount of expansion required for visible condensation varies with different apparatus, and he usually gives the results of a series of experiments as applicable only to the apparatus used therein.

Apparently then, there is not only sufficient plausible theory to explain the observed phenomena, but also little or nothing in the results of laboratory experiments inconsistent with the outdoor observations.

To sum up, from the point of view suggested by the observations under discussion, saturation of atmospheric water vapor is a relative condition, condensation beginning upon certain nuclei as soon as there is any vapor at all in the air, and progressing gradually either with growing vapor pressure, or with other favoring conditions such as concentration of dissolved matter in the nuclei, electric charge thereon, or change of shape of the condensing surface, in addition to the suitable conditions of temperature that alone are commonly considered to be the controlling factor for any given vapor pressure. Thus water vapor is always saturated for certain nuclei that are usually found in the atmosphere.

Fog then is normally present in the lower atmosphere, at least over and near the sea. It is often invisible, the visibility depending upon the size of the droplets (nuclei) and their number per unit volume of space. It is more often either unnoticed or not recognized as fog, because it usually has the aspect of a thin, smoky haze.

This view affords a good explanation of the fact that a sling psychrometer rarely indicates saturation, even in dense fogs.

[29] This is the distance of the hills on the farther side of Buzzards Bay which served as a background, by means of which the existence in the air over the bay of visible haze, and its relative density, were observed by me.

In such cases the vapor is not saturated with respect to the covering of the wet bulb, altho it is supersaturated with respect to the nuclei or smaller drops of the preceding stages of fog growth.

There seems to be no reason to discriminate between fog and higher clouds in respect to the general aspects of condensation, evaporation, and stable existence in unsaturated air,[30] tho the distribution of the various kinds of nuclei probably varies with height.

It is suggestive to note here that at Blue Hill it has been found that raindrops are of all sizes from those of the finest mist to the largest drops; and it has been found necessary to adopt an arbitrary definition of what should be recorded as rain.

Those observations combined with the observations under discussion, therefore, tend to show a regular gradation in the size of water particles from the smallest, invisible condensation nuclei up to the largest raindrop.

[30] It appears from the observations made in Germany from manned balloons that even the vapor of dense clouds is rarely saturated with respect to the psychrometer. In 61 ascents discust by Dr. Reinhard Süring, in Wissenschaftliche Luftfahrten, Bd. 3, S. 133 *et seq.*, clouds were past thru by the balloons 43 times, and 100 per cent relative humidity was found in 6 clouds only.

CLIMATOLOGICAL SUMMARY.

By Mr. JAMES BERRY, Chief of the Climatological Division.

TEMPERATURE AND PRECIPITATION BY SECTIONS, JANUARY, 1907.

In the following table are given, for the various sections of the Climatological Service of the Weather Bureau, the average temperature and rainfall, the stations reporting the highest and lowest temperatures with dates of occurrence, the stations reporting greatest and least monthly precipitation, and other data, as indicated by the several headings.

The mean temperatures for each section, the highest and lowest temperatures, the average precipitation, and the greatest and least monthly amounts are found by using all trustworthy records available.

The mean departures from normal temperature and precipitation are based only on records from stations that have ten or more years of observation. Of course the number of such records is smaller than the total number of stations.

Section.	Temperature—in degrees Fahrenheit.								Precipitation—in inches and hundredths.					
	Section average.	Departure from the normal.	Monthly extremes.						Section average.	Departure from the normal.	Greatest monthly.		Least monthly.	
			Station.	Highest.	Date.	Station.	Lowest.	Date.			Station.	Amount.	Station.	Amount.
Alabama	54.4	+10.2	Pushmataha Wetumpka	84 84	15 9	Riverton	13	28	2.20	−2.56	Dadeville	4.00	Letohatchie	1.03
Arizona	44.5	+ 1.2	Aztec Yuma	78 78	27 28	Flagstaff (*a*)	−10	2	2.66	+1.16	Huachuca Reservoir	15.96	Parker	0.13
Arkansas	49.2	+ 9.7	Pine Bluff	82	7	Pond	− 8	26	5.80	+1.38	Malvern	11.80	Montrose	1.95
California	43.9	− 1.0	Craftonville	90	22	Tamarack	−14	17	7.46	+2.26	Helen Mine	27.21	Mammoth Tank	0.00
Colorado	27.9	+ 4.4	Lamar	76	4	Antelope Springs	−34	3	0.81	−0.12	Corona	5.60	2 stations	0.00
Florida	63.4	+ 5.3	Clermont Orange City	88 88	2 20	Molino	25	22, 23	0.80	−2.24	Pensacola	4.05	New Smyrna	0.00
Georgia	54.4	+ 9.9	Statesboro Valdosta	84 84	14 14	Diamond	17	28	1.29	−2.52	Eatonton	3.06	Valdosta	0.10
Hawaii	70.0†	......	Olaa Mill, Hawaii	90	23	Volcano House, Haw	49	22, 23	12.07‡	......	Olokele Ditch, Kauai	34.04	Kalopa, Hawaii	1.10
Idaho	22.6	− 3.9	Hotspring	61	29	Chesterfield	−32	16	2.64	+0.84	Landore	8.28	Salmon	0.58
Illinois	31.1	+ 4.8	Tilden	77	19	Zion	−11	26	5.69	+3.22	Equality	10.90	Lanark	2.67
Indiana	34.0	+ 6.7	Farmersburg	77	19	Auburn	− 7	23	6.96	+4.27	Marengo	11.83	Lima	2.94
Iowa	18.8	− 1.0	Keokuk	68	7	Forest City Inwood	−22 −22	30 30	1.52	+0.57	Burlington	5.30	Atlantic	0.20
Kansas	31.2	+ 1.8	3 stations	75	6, 7	Ellsworth	− 7	26	2.38	+1.53	Yates Center	7.16	Coolidge	0.05
Kentucky	43.2	+ 8.6	Loretto	83	20	Williamsburg	−11	29	8.02	+4.02	Owensboro	12.73	Williamsburg	1.62
Louisiana	60.7	+10.8	Lafayette	89	7, 15	Plain Dealing	20	27	1.83	−2.69	Sugartown	4.45	Robeline	0.55
Maryland and Delaware	35.8	+ 4.1	Milford, Del	77	7, 8	Oakland, Md	−19	23	3.08	+0.04	Deer Park, Md	7.00	Millsboro, Del	1.28
Michigan	20.6	+ 0 5	Dundee	69	19, 20	Humboldt	−42	30	3.42	+1.27	Vassar	6.80	Humboldt	0.65
Minnesota	3.8	− 4.8	New Richmond St. Charles	44 44	5 6	Bagley	−45	22	1.17	+0.47	Mount Iron	2.70	Pipestone	0.14
Mississippi	56.0	+ 9.8	Greenwood Leakesville	83 83	14 15	Hernando Holly Springs	16 16	26, 28 27	2.41	−3.06	Walnut Grove	6.58	Fayette	0.15
Missouri	34.3	+ 3.8	Caruthersville	76	18	Unionville	− 5	26	5.10	+2.85	Versailles	9.45	Conception	1.26
Montana	6.7	−12.7	3 stations	55	3 dates	Chinook	−45	14	1.60	+0.77	Saltese	6.79	Graham	0.22
Nebraska	19.9	− 1.2	Imperial	64	23	Agate	−24	3	0.50	−0.10	Wisner	2.14	Loup	T.
Nevada	27.0	− 1.9	Wadsworth	73	31	Squaw Valley	−28	16	2.22	+0.93	Palmetto	8.90	Carson Dam	0.06
New England*	20.5	− 1.1	3 stations	65	7	Oquossoc, Me	−45	17	2.81	−0.85	Danielson, Conn	5.62	Greenville, Me	0.98
New Jersey	31.8	+ 1.8	Cape May C. H	71	7	Layton	−19	27	3.50	−0.30	Chatham	5.80	Cape May C. H	1.93
New Mexico	38.0	+ 5.6	Monument	77	22	Dulce	−27	3	1.19	+0.68	Cloudcroft	6.32	Valley	T.
New York	22.5	+ 0.9	Otto	74	20	Indian Lake North Lake	−35 −35	24 24	2.94	+0.08	North Lake	5.28	Harkness	0.99
North Carolina	48.1	+ 8.2	Southern Pines	84	15	Saxon	4	28	0.77	−3.02	Southport	2.35	2 stations	0.05
North Dakota	−6.2	−13.6	Willow City	48	1	Willow City	−45	14	1.40	+0.81	Lakota	3.94	Berthold Agency	0.30
Ohio	32.2	+ 4.4	Ironton	75	3	Green Hill	−23	27	6.11	+3.41	Green	9.55	Bowling Green	3.43
Oklahoma and Indian Territories.	43.2	+ 5.8	Durant, Ind. T S. McAlester, Ind. T.	80 80	18 13	Fort Reno, Okla	8	27	2.63	+1.40	Calvin, Ind. T	5.09	Kenton, Okla	0.27
Oregon	30.6	− 4.4	Bay City	71	23	Prineville	−20	15	6.64	+0.81	Port Orford	19.56	Riverside	0.60
Pennsylvania	30.0	+ 2.4	Irwin	75	4	Pocono Lake Wellsboro	−23 −23	27 24	4.36	+1.12	Confluence	9.69	Center Hall	2.14
Porto Rico	70.9	......	Anasco	97	27	Cayey	46	28	2.16	......	Barros	7.67	Juana Diaz	0.00
South Carolina	53.4	+ 7.7	Conway Florence	89 89	13 13	Darlington Dillon	18 18	29 29	0.71	−2.88	Georgetown	1.91	2 stations	T.
South Dakota	6 4	− 8.9	Fort Meade	60	23	Kidder	−33	15	1.17	+0.79	Leola	2.95	Howard	0.25
Tennessee	48.2	+10.5	3 stations	79	18	Springdale	− 5	28	2.91	−1.52	Union City	8.20	McGhee	0.45
Texas	55.5	+ 8.6	Eagle Pass	92	13	Henrietta	10	26	1.04	−1.20	Arthur City	4.10	5 stations	0.00
Utah	28.0	+ 2.1	3 stations	66	26, 28	Ranch Tropic	−20 −20	2 17	2.30	+1.33	Park City	10.96	2 stations	0.00
Virginia	41.4	+ 6.0	Arvonia	81	8	Arvonia	− 6	28	1.65	−1.52	Lincoln	3.36	Danville	0.33
Washington	24.3	− 7.7	Kosmos	68	21	Twisp	−28	14	4.40	−0.13	Clearwater	16.59	Conconully	0.75
West Virginia	38.7	+ 6.4	Sutton	76	3	Cuba	−15	28	6.41	+2.92	Pickens	11.54	Lost City	2.35
Wisconsin	13.0	− 2.0	3 stations	50	18, 19	Downing Hayward	−40 −40	27 30	2.06	+0.92	Hillsboro	4.05	Antigo	0.44
Wyoming	18.2	− 1.4	Saratoga	69	6	Wells	−40	16	1.27	+0.28	South Pass City	5.30	Cheyenne (Ex. Far.)	0.05

* Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, and Connecticut. † 46 stations, with an average elevation of 640 feet. ‡ 140 stations.

THE WEATHER OF THE MONTH.

By Mr. P. C. DAY, Assistant Chief, Division of Meteorological Records.

PRESSURE.

The distribution of mean atmospheric pressure for January, 1907, over the United States and Canada is graphically shown on Chart VI, and the average values and departures from the normal are shown for each station in Tables I and V.

Over northern Minnesota, North Dakota, and eastern Montana, and extending northward into the districts of Canada from Hudson Bay to British Columbia, the great continental winter area of high pressure was much intensified during the month, and barometric readings were almost continuously above the normal. From the southern edge of this region of high pressure were projected numerous highs, which, following each other in rapid succession, gave severe wintry conditions along the entire northern boundary from the Great Lakes westward to the Pacific.

Unusually high pressure over the Ohio Valley and middle Atlantic coast districts acted somewhat as a barrier to the southeastward progress of the high areas, with corresponding cold, discharged over the northwestern States, and their energies were largely dissipated in the region west of the Great Lakes.

Over the central Rocky Mountain district, where high pressure is the rule during January, and the clear, dry atmosphere intensifies radiation, thereby reinforcing the cold waves moving southeastward along the eastern slopes of the Rockies, there was a marked absence of normal conditions.

Low pressure was the rule in the above-mentioned district, and it was the central point in the formation of numerous low areas whose eastward movements were along the southern edge of the high areas from the north as far eastward as the Great Lakes, and thence along the northern edge of the high pressure area over the Ohio Valley and the Middle Atlantic States. As a result of the unusual distribution of pressure, the surface winds departed materially from their normal courses, and districts in close proximity showed continuously marked variations in weather conditions, depending upon whether they were under the influence of cold northerly or warm southerly winds.

Over northern New England, the upper Lakes, and the upper Mississippi and Missouri valleys, cold northerly winds prevailed; over the Atlantic and Gulf districts, the lower Mississippi Valley, and westward to the Pacific, warm southerly winds predominated.

Pressure was above the normal in all districts of Canada and over all portions of the United States east of the Rocky Mountains. The departures were unusually large over British Columbia and the adjoining territories on the east, where the monthly averages exceeded the normal from .15 to .25 inch. Over all districts in the United States west of the main ranges of the Rockies pressure averaged lower than the normal.

TEMPERATURE.

January, 1907, was a month of marked extremes in the monthly temperature. Over the entire southern portion of the United States abnormally warm weather prevailed, especially during the first twenty days, while along the northern border from the Lakes westward to the Pacific and over northern New England the month was one of continued cold.

Over northern Minnesota, North Dakota, the northern portions of Montana, Idaho, and Washington, and extending into the adjoining Canadian districts, the negative departures from the normal were phenomenal, ranging from 10° to more than 20° daily below the average. At numerous points in Montana and adjoining districts the month was the coldest on record, altho the minimum extremes were not as great as in some previous years. In northern Minnesota, North Dakota, and northeastern Montana, the maximum temperatures did not rise above the freezing point during the entire month, and with the exception of one or two days the minimum temperatures were continuously below zero. While severe winter weather was the rule along the northern border, warm, springlike conditions existed in the Gulf States, where monthly means as high as, and in some cases higher than, ever before recorded were the rule.

A severe cold wave overspread New England on the 16th and 17th, with minimum temperatures in the more northern portions from 20° to more than 40° below zero, values in some instances lower than previously recorded in more than forty years. A rather severe cold wave overspread the central valleys, Lake region, and eastern districts from the 20th to the 24th, with freezing temperatures in the interior of the east Gulf States, and minimum temperatures 25° or more below zero in central New England.

No severe cold waves occurred over the Great Plains from Nebraska to Texas, the lower Mississippi Valley, nor over the central and southern districts of the Plateau and Pacific coast regions.

PRECIPITATION.

In the Ohio and middle Mississippi valleys the precipitation, as in November and December, was largely in excess of the average, and serious floods prevailed at different periods of the month in nearly all the smaller rivers and streams tributary thereto.

Precipitation was also comparatively heavy over the upper Mississippi and Missouri valleys, the Rocky Mountain and Plateau districts; also over practically all of California, where the month, like December, 1906, was unusually wet, with showers of almost daily occurrence in the central and northern districts and generally abundant rains in the southern portion of the State.

Exceptionally heavy precipitation for the month occurred over western Colorado, northern New Mexico, and generally over Utah.

Over New England, the Atlantic coast districts, Florida, the Gulf States, eastern Tennessee, and western North Carolina the monthly precipitation was much below the average fall.

Along the Atlantic coast from Virginia to Florida and the entire Gulf coast, a marked deficiency in rainfall has prevailed since November, 1906, inclusive, the accumulated deficiency during that period amounting to as much as 10 inches at points on the immediate coast.

Over western North Carolina, eastern Tennessee, and northern Georgia the monthly amounts were the least recorded in any January during thirty-five years.

Precipitation was also deficient to a large degree over the western and northern portions of Washington.

SNOWFALL.

The snowfall over all southern districts was comparatively light, and especially over the districts between the Mississippi River and the Rocky Mountains and south of Nebraska. Over the districts east of the Mississippi Valley snowfall did not extend south of the northern part of the Gulf States.

Snowfall was unusually heavy from the upper Lake region westward along the northern border to Washington, the amounts over North Dakota and eastern Montana being phenomenal both as to depth of fall and length of period during which the ground was covered.

Snow was generally heavy over the western mountain and Plateau districts, and a large amount has accumulated at the higher elevations, while over the lower levels the unfrozen ground generally absorbed the rain and melting snow, thus assuring an unusual supply of water during the coming season over most sections.

At the end of the month but little snow remained on the ground except over New England, New York, western Penn-

sylvania, the Lake region, upper Mississippi and Missouri valleys, and in the elevated portions of the western mountain districts.

From Lake Superior westward to northern Washington, the ground was covered to an unusual depth. Over the greater part of northern Minnesota, nearly the whole of North Dakota, and the northeastern counties of Montana, the snow covering at the close of the month was from two to more than four feet in depth.

HUMIDITY AND CLOUDINESS.

Humid conditions prevailed in all districts, except over the immediate coast of the South Atlantic and Gulf States and the entire western parts of Oregon and Washington. Over the entire Rocky Mountain and Plateau country the humidity was far in excess of the average, and cloudy weather predominated, especially over the central and southern districts of that region.

Cloudy weather was also prevalent from the Lake region to the northern part of the Gulf States, and from the Appalachian Mountains westward over the Ohio and central Mississippi valleys.

An excess of sunshine prevailed along the south Atlantic and Gulf coasts and over western Washington.

Average temperatures and departures from the normal.

Districts.	Number of stations.	Average temperatures for the current month.	Departures for the current month.	Accumulated departures since January 1.	Average departures since January 1.
		°	°	°	°
New England	12	23.8	— 1.2	....	....
Middle Atlantic	16	36.2	+ 3.4	....	....
South Atlantic	10	53.0	+ 7.0	....	....
Florida Peninsula *	8	65.2	+ 5.4	....	....
East Gulf	11	57.4	+ 9.5	....	....
West Gulf	10	56.8	+10.4	....	....
Ohio Valley and Tennessee	13	41.3	+ 7.4	....	....
Lower Lake	10	27.0	+ 1.6	....	....
Upper Lake	12	18.1	0.0	....	....
North Dakota *	9	— 5.8	—11.4	....	....
Upper Mississippi Valley	15	22.7	+ 2.4	....	....
Missouri Valley	12	20.8	+ 0.5	....	....
Northern Slope	9	11.6	— 5.9	....	....
Middle Slope	6	33.2	+ 4.2	....	....
Southern Slope *	7	46.3	+ 8.1	....	....
Southern Plateau *	12	40.7	+ 2.8	....	....
Middle Plateau *	10	27.5	+ 2.4	....	....
Northern Plateau *	12	20.4	— 4.7	....	....
North Pacific	7	35.1	— 4.1	....	....
Middle Pacific	8	45.7	— 1.3	....	....
South Pacific	4	50.0	— 0.6	....	....

* Regular Weather Bureau and selected cooperative stations.

In Canada.—Director R. F. Stupart says:

The temperature was below the average in all portions of the Dominion, except in the Peninsula of Ontario, where it was either average or 1° above. The negative departures in British Columbia, Alberta, and Saskatchewan, ranging as they did from 10° to 22°, were phenomenal, and in these provinces it was the coldest January of which the meteorological service has any record. In Manitoba the negative departures were also pronounced, but the mean temperature was not as low in that province as recorded in some previous months of January. Over the greater portion of Ontario and thruout Quebec and the Maritime Provinces the negative departures ranged from 1° to 3°.

Average relative humidity and departures from the normal.

Districts.	Average.	Departure from the normal.	Districts.	Average.	Departure from the normal.
	%			%	
New England	76	0	Missouri Valley	81	+ 6
Middle Atlantic	77	+ 1	Northern Slope	80	+ 9
South Atlantic	81	+ 4	Middle Slope	76	+ 9
Florida Peninsula	79	— 2	Southern Slope	72	+11
East Gulf	80	+ 4	Southern Plateau	70	+17
West Gulf	80	+ 4	Middle Plateau	79	+ 9
Ohio Valley and Tennessee	79	+ 2	Northern Plateau	82	+ 3
Lower Lake	85	+ 4	North Pacific	79	— 4
Upper Lake	84	+ 1	Middle Pacific	84	+ 2
North Dakota	85	+ 6	South Pacific	79	+ 7
Upper Mississippi Valley	86	+ 8			

Maximum wind velocities.

Stations.	Date.	Velocity.	Direction.	Stations.	Date.	Velocity.	Direction.
Bismarck, N. Dak	19	50	nw.	New York, N. Y	9	59	w.
Block Island, R. I	9	56	nw.	Do	20	58	w.
Do	21	52	w.	Norfolk, Va	20	52	sw.
Buffalo, N. Y	10	60	sw.	North Head, Wash	2	72	se.
Do	20	84	sw.	Do	3	84	se.
Do	21	50	w.	Do	18	52	nw.
Burlington, Vt	3	50	s.	Do	20	72	se.
Do	19	50	se.	Do	31	51	s.
Do	20	60	se.	Oklahoma, Okla	19	58	s.
Canton, N. Y.	9	50	w.	Peoria, Ill	20	51	w.
Do	20	78	sw.	Pittsburg, Pa	20	62	w.
Cape Henry, Va	26	52	n.	Point Reyes Light, Cal	1	60	nw.
Chicago, Ill	19	52	w.	Do	4	64	s.
Do	20	60	w.	Do	5	50	nw.
Cleveland, Ohio	19	58	s.	Do	6	52	nw.
Do	20	66	sw.	Do	10	58	s.
Do	21	54	w.	Do	12	52	nw.
Columbus, Ohio	20	66	nw.	Do	16	66	sw.
Detroit, Mich	20	54	sw.	Port Huron, Mich	19	50	sw.
Fort Smith, Ark	19	66	w.	Do	20	58	w.
Grand Rapids, Mich	19	50	w.	Rochester, N. Y	20	54	w.
Huron, S. Dak	2	50	s.	St. Louis, Mo	19	52	w.
Indianapolis, Ind	19	52	sw.	Sioux City, Iowa	19	66	nw.
Do	20	52	sw.	Southeast Farallon, Cal	4	54	s.
Knoxville, Tenn	19	58	sw.	Do	16	58	s.
Lexington, Ky	19	54	sw.	Do	20	57	sw.
Do	20	52	w.	Springfield, Mo	19	53	sw.
Memphis, Tenn	19	60	w.	Syracuse, N. Y	20	57	sw.
Modena, Utah	15	50	sw.	Tatoosh Island, Wash	3	62	sw.
Mount Tamalpais, Cal	4	56	se.	Do	7	59	e.
Do	12	51	nw.	Do	8	61	e.
Do	31	52	sw.	Do	13	56	ne.
Mount Weather, Va	4	72	nw.	Do	14	65	ne.
Do	9	58	nw.	Do	20	61	s.
Do	20	60	nw.	Toledo, Ohio	19	57	s.
Do	21	50	nw.	Do	20	70	sw.
Do	22	58	nw.	Valentine, Nebr	19	54	nw.
Do	23	54	nw.				

Average cloudiness and departures from the normal.

Districts.	Average.	Departure from the normal.	Districts.	Average.	Departure from the normal.
New England	7.0	+ 1.2	Missouri Valley	7.2	+ 2.1
Middle Atlantic	6.6	+ 1.0	Northern Slope	5.9	+ 1.3
South Atlantic	4.9	— 1.9	Middle Slope	6.1	+ 2.3
Florida Peninsula	3.4	— 1.3	Southern Slope	5.1	+ 1.0
East Gulf	5.4	— 0.2	Southern Plateau	4.4	+ 1.5
West Gulf	6.4	+ 1.0	Middle Plateau	6.3	+ 1.9
Ohio Valley and Tennessee	7.5	+ 1.1	Northern Plateau	7.4	+ 0.1
Lower Lake	8.2	+ 0.7	North Pacific	6.5	— 0.6
Upper Lake	7.7	+ 0.9	Middle Pacific	7.3	+ 2.1
North Dakota	6.0	+ 1.3	South Pacific	6.4	+ 2.3
Upper Mississippi Valley	7.5	+ 2.2			

Average precipitation and departures from the normal.

Districts.	Number of stations.	Average.		Departure.	
		Current month.	Percentage of normal.	Current month.	Accumulated since Jan. 1.
		Inches.		Inches.	Inches.
New England	12	2.97	77	—0.9	....
Middle Atlantic	16	2.07	60	—1.4	....
South Atlantic	10	0.76	18	—3.4	....
Florida Peninsula *	8	0.50	17	—2.5	....
East Gulf	11	2.37	48	—2.6	....
West Gulf	10	2.11	64	—1.2	....
Ohio Valley and Tennessee	13	6.12	145	+1.9	....
Lower Lake	10	4.18	156	+1.5	....
Upper Lake	12	2.56	124	+0.5	....
North Dakota *	9	1.20	240	+0.7	....
Upper Mississippi Valley	15	3.46	197	+1.7	....
Missouri Valley	12	2.21	219	+1.2	....
Northern Slope	9	0.84	131	+0.2	....
Middle Slope	6	1.02	142	+0.3	....
Southern Slope *	7	1.35	142	+0.4	....
Southern Plateau *	12	2.03	197	+1.0	....
Middle Plateau *	10	1.36	128	+0.3	....
Northern Plateau *	12	2.12	109	+0.1	....
North Pacific	7	5.68	76	—1.8	....
Middle Pacific	8	6.21	115	+0.8	....
South Pacific	4	5.60	200	+2.8	....

* Regular Weather Bureau and selected cooperative stations.

In Canada.—Director Stupart says:

The precipitation was generally below the average in British Columbia, the negative departures varying from half an inch to an inch and a

half. In the western provinces the precipitation was all snow, which in some localities was a few inches more than the usual quantity and in others a few inches less. In Ontario the precipitation was above the average amount in the Lake Superior region and in the Peninsula of Ontario, and much below again in the eastern portion of the province, Kingston recording a negative departure of 1.5 inches, Ottawa 1.1 inches, and Rockliffe 1.1 inches. In Quebec it was slightly in excess of the average in the eastern portion and deficient elsewhere. In the Maritime Provinces it was everywhere below the average, except in one or two isolated localities, where it was slightly above; the chief positive departures were St. John, 1.6 inches, and Fredericton, 1.3 inches.

At the close of the month the whole Dominion was snow covered, the depth on the ground differing materially with the district. In British Columbia the amount in many localities was considerable; even coast stations similar to New Westminster report continuous sleighing thruout the month, which is most unusual. In the western Provinces, owing to the long-continued cold weather, the snow which covered the ground at the close of 1906, with the addition of that which fell in January, now amounts to a depth of from 10 to over 30 inches, a marked contrast to the conditions prevailing in January last year, when in some localities the ground was bare of snow and in others it was but lightly covered. In Ontario, in the Lake Superior district, and in far northern localities, the snow on the ground varies from 18 to 24 inches, elsewhere from 3 to 10 inches. In Quebec it varies from 18 to 26 inches in the western portion, to 46 and 48 inches in the eastern portion. In the Maritime Provinces it is from 4 to 11 inches, and very locally 18 inches.

DESCRIPTION OF TABLES AND CHARTS.

By Mr. P. C. DAY, Assistant Chief, Division of Meteorological Records.

Table I gives the data ordinarily needed for climatological studies for about 152 Weather Bureau stations making simultaneous observations at 8 a. m. and 8 p. m., seventy-fifth meridian time daily, and for about 36 others making only one observation. The altitudes of the instruments above ground are also given.

Table II gives, for about 2800 stations occupied by cooperative observers, the absolute maximum and minimum temperatures of the month, the mean temperature deduced from the average of all the daily maxima and minima, or other readings, as indicated by the numeral following the name of the station, the total monthly precipitation, and the total depth in inches of any snow that may have fallen. When it is possible that there may have been snow of which no record has been made, that fact is indicated by leaders, thus (....).

Table III gives, for all regular stations, the four component directions and the direction resultant of the wind based on the twice-daily observations, taken at 8 a. m. and 8 p. m., respectively, or upon a single observation at a limited number of the less important stations, and without considering the velocity.

Stations taking but a single observation daily are indicated in the table by appropriate references.

The total wind movement for the whole month, for each station, is given in Table I.

Table IV gives a record of precipitation the intensity of which at some period of the storm's continuance equaled or exceeded the following rates:

Duration, minutes	5	10	15	20	25	30	35	40	45	50	60
Rates per hour (inches)	3.00	1.80	1.40	1.20	1.08	1.00	0.94	0.90	0.87	0.84	0.80

In cases where no storm of sufficient intensity to entitle it to a place in the full table has occurred, the greatest precipitation of any single storm has been given, also the greatest hourly fall during that storm.

Table V gives, for about 30 stations of the Canadian Meteorological Service, the means of pressure and temperature, total precipitation and depth of snowfall, and the respective departures from normal values, except in the case of snowfall.

Table VI gives the heights of rivers referred to zeros of gages. These zeros are arbitrarily fixt, but, as a rule, are set at the plane of lowest water, if possible. The river gages are read once daily (8 a. m., seventy-fifth meridian time), and in times of emergency more frequently. The table shows the highest and lowest of all readings taken, the means of the regular daily readings, and the absolute monthly ranges.

Chart I.—Hydrographs for seven principal rivers of the United States.

Chart II, tracks of centers of high areas, and Chart III, tracks of centers of low areas. The roman numerals show number and chronological order of the centers. The figures within the circles show the days of the month; the letters *a* and *p* indicate, respectively, the observations at 8 a. m. and 8 p. m., seventy-fifth meridian time. Within each circle is also given (Chart II) the highest barometric reading and (Chart III) the lowest reading reported at or near the center at that time, and in both cases as reduced to sea level and standard gravity.

Chart IV.—Total precipitation. The scale of shades showing the depth is given on the chart. Where the monthly amounts are too small to justify shading, and over sections of the country where the stations are too widely separated, or the topography is too diversified to warrant reasonable accuracy in shading, the actual depths are given for a limited number of representative stations. Amounts less than 0.005 inch are indicated by the letter "T," and no precipitation by 0.

Chart V.—Percentage of clear sky between sunrise and sunset. The average cloudiness at each Weather Bureau station is determined by numerous personal observations between sunrise and sunset. The difference between the observed cloudiness and 100 is assumed to represent the percentage of clear sky, and the values thus obtained are the basis of this chart, which does not relate to the nighttime.

Chart VI.—Isobars and isotherms at sea level and surface wind resultants. The pressures have been reduced to sea level and standard gravity by the method described by Prof. Frank H. Bigelow on pages 13–16 of the REVIEW for January, 1902. The pressures have also been reduced to the mean of the twenty-four hours by the application of a suitable correction to the mean of the 8 a. m. and 8 p. m. readings, at stations taking two observations daily, and to the 8 a. m. or 8 p. m. observation, respectively, at stations taking but a single observation. The diurnal corrections so applied will be found in Table 27, Volume II, Annual Report of the Chief of Weather Bureau, 1900–1901, pp. 140–164.

The isotherms on the sea-level plane have been constructed by means of the data summarized in chapter 8 of the Annual Report of the Chief of the Weather Bureau for 1900–1901, Volume II. The correction $t_0 - t$, or temperature on the sea-level plane minus the station temperature, as given by Table 48 of the above report, is added to the observed surface temperature to obtain the adopted sea-level temperature.

The surface wind direction resultants are computed from observations at 8 a. m. and 8 p. m. daily, or from observations at but one of those hours at stations taking a single observation only. The duration resultants are shown by figures attached to the arrows.

Chart VII.—Total snowfall. This is based on the reports from regular and cooperative observers, and shows the depth in inches and tenths of the snowfall during the month. In general, the depth is shown by lines inclosing areas of equal snowfall, but in special cases figures are also given.

Chart VIII.—Depth of snow on ground at the end of month, exprest in inches and tenths.

TABLE I.—*Climatological data for U. S. Weather Bureau stations, January, 1907.*

Stations.	Elevation of instruments: Barometer above sea level, feet.	Elevation: Thermometers above ground.	Elevation: Anemometer above ground.	Pressure, in inches: Actual, reduced to mean of 24 hours.	Pressure: Sea level, reduced to mean of 24 hrs.	Pressure: Departure from normal.	Temperature of the air, in degrees Fahrenheit: Mean max. + mean min. ÷ 2.	Temperature: Departure from normal.	Temperature: Maximum.	Temperature: Date.	Temperature: Mean maximum.	Temperature: Minimum.	Temperature: Date.	Temperature: Mean minimum.	Temperature: Greatest daily range.	Mean wet thermometer.	Mean temperature of the dew-point.	Mean relative humidity, per cent.	Precipitation, in inches: Total.	Precipitation: Departure from normal.	Precipitation: Days with .01, or more.	Wind: Total movement, miles.	Wind: Prevailing direction.	Wind: Maximum velocity: Miles per hour.	Wind: Maximum velocity: Direction.	Wind: Maximum velocity: Date.	Clear days.	Partly cloudy days.	Cloudy days.	Average cloudiness during daylight, tenths.	Total snowfall.
New England.							23.8	− 1.2										76	2.97	− 0.9										7.0	
Eastport	76	69	85	30.07	30.16	+ .16	17.8	− 2.6	51	20	27	−20	17	8	37	16	12	78	5.05	+ 1.1	20	10,460	w.	42	e.	22	6	8	17	7.1	35.8
Portland, Me.	103	81	117	30.08	30.21	+ .16	18.5	− 4.0	48	20	26	−16	24	11	29	16	11	72	2.46	− 1.2	13	6,483	nw.	44	nw.	9	6	12	13	6.0	19.9
Concord	288	70	79	29.88	30.21	+ .16	18.6	− 2.3	49	20	27	−12	31	10	33	...	...	...	1.05	− 2.3	9	3,913	nw.	32	w.	20	8	10	13	6.2	12.5
Burlington	404	12	47	29.75	30.22	+ .17	15.2	− 3.9	47	20	24	−17	17	6	38	...	...	...	1.02	− 0.8	13	9,144	nw.	60	se.	20	6	7	18	7.1	7.1
Northfield	876	16	70	29.22	30.22	+ .17	13.0	− 2.5	56	20	24	−27	17	2	41	17	9	85	1.48	− 1.3	17	6,147	n.	48	sw.	20	2	11	18	7.7	9.5
Boston	125	115	188	30.07	30.21	+ .16	27.0	0.0	58	20	35	− 7	24	19	26	24	18	71	2.54	− 1.6	16	7,953	nw.	36	nw.	9	4	7	20	7.3	16.1
Nantucket	12	14	90	30.17	30.18	+ .14	32.6	+ 1.2	55	20	39	6	24	26	29	30	26	80	5.33	+ 1.6	16	12,093	nw.	50	sw.	4	6	6	19	7.2	8.9
Block Island	26	11	46	30.17	30.20	+ .13	31.5	+ 0.4	55	20	38	− 1	24	24	29	30	25	77	3.37	− 0.8	15	14,372	nw.	56	nw.	9	5	12	14	6.8	4.9
Narragansett	...	9	...	...	...	...	29.4	+ 0.6	59	7	38	− 6	24	21	28	...	...	...	3.80	− 2.5	14	...	w.	...	...	...	11	4	16	...	9.8
Providence	160	57	67	30.03	30.22	+ .16	27.8	− 0.3	62	7	36	− 9	24	20	27	25	20	74	2.63	...	17	5,533	w.	33	nw.	9	10	4	17	6.7	15.3
Hartford	159	122	132	30.04	30.23	+ .16	26.1	− 1.3	62	7	34	− 9	24	19	25	23	18	75	2.94	...	14	4,656	n.	32	sw.	10	3	7	21	7.7	16.4
New Haven	106	116	155	30.10	30.22	+ .14	28.4	+ 0.9	65	7	36	− 7	24	21	26	25	19	71	3.56	− 0.8	18	7,210	n.	39	w.	9	5	11	15	6.9	13.6
Mid. Atlantic States.							36.2	+ 3.4										77	2.07	− 1.4										6.6	
Albany	97	102	115	30.13	30.25	+ .18	22.4	− 0.8	50	20	31	−11	27	14	30	21	18	83	1.71	− 1.2	13	6,188	s.	35	s.	10	2	3	16	7.6	7.8
Binghamton	875	79	90	29.22	30.18	+ .10	24.2	+ 1.6	62	7	33	−15	27	16	36	...	...	...	2.63	+ 0.4	18	4,855	w.	44	w.	20	3	8	20	7.8	16.9
New York	314	108	350	29.87	30.23	+ .13	32.2	+ 1.7	62	7	39	0	24	26	24	30	25	74	3.26	− 0.8	19	9,060	nw.	59	w.	9	7	9	15	6.7	10.9
Harrisburg	374	94	104	29.83	30.25	+ .15	30.6	+ 0.3	58	8	37	5	24	24	24	28	24	78	2.66	− 1.0	15	5,443	e.	40	w.	20	5	8	18	7.0	9.4
Philadelphia	117	116	184	30.11	30.24	+ .13	34.2	+ 2.2	65	7	41	6	24	27	28	31	26	73	2.65	− 0.7	16	8,043	n.	33	nw.	20	7	5	19	6.8	5.6
Scranton	805	111	119	29.31	30.21	+ .12	28.6	...	62	7	36	− 6	27	21	33	26	21	76	2.92	...	21	5,939	sw.	42	w.	20	4	9	18	7.5	14.3
Atlantic City	52	37	48	30.18	30.24	+ .13	35.0	+ 2.5	60	7	42	4	24	28	26	32	28	78	2.79	− 1.0	13	6,232	n.	32	sw.	20	6	5	20	7.3	5.4
Cape May	17	48	52	30.24	30.26	+ .14	36.2	+ 1.8	63	8	43	5	24	29	29	33	...	...	2.65	− 1.2	14	6,565	n.	31	nw.	21	5	14	12	6.4	3.6
Baltimore	123	69	117	30.10	30.23	+ .11	36.5	+ 2.5	74	7	44	11	24	29	28	32	27	72	3.14	− 0.2	14	5,049	nw.	45	nw.	4	5	6	20	7.3	6.7
Washington	112	59	76	30.12	30.24	+ .11	37.2	+ 4.0	76	7	46	10	27	29	33	33	29	76	2.54	− 1.0	15	3,721	s.	38	nw.	4	6	8	17	7.1	4.6
Cape Henry	18	11	58	30.22	30.24	+ .11	44.8	+ 4.6	76	15	53	20	24	36	35	...	...	...	0.72	− 3.5	6	10,416	n.	52	n.	26	11	15	5	4.8	1.1
Lynchburg	681	83	88	29.47	30.23	+ .10	43.1	+ 6.3	76	7	54	6	28	32	41	38	34	75	0.98	− 3.0	9	3,101	sw.	26	nw.	4	5	16	10	5.9	1.5
Mount Weather	1,725	10	57	28.32	30.23	+ .10	32.4	...	67	7	41	4	23	24	35	30	28	86	2.64	...	12	13,243	nw.	72	nw.	4	6	12	13	6.3	8.8
Norfolk	91	102	111	30.15	30.25	+ .12	46.0	+ 5.6	76	15	55	19	24	37	35	40	36	75	1.03	− 2.8	6	7,183	n.	52	sw.	20	7	15	9	5.5	0.7
Richmond	144	145	153	30.08	30.24	+ .11	42.8	+ 4.8	78	7	53	14	28	33	34	...	...	...	1.22	− 1.7	10	6,417	s.	47	s.	20	8	10	13	5.9	3.1
Wytheville	2,293	40	47	27.78	30.22	+ .08	42.2	+10.0	67	19	52	10	28	33	35	38	35	82	0.95	− 2.1	14	4,885	w.	35	w.	20	9	11	11	5.5	0.5
S. Atlantic States.							53.0	+ 7.0										81	0.76	− 3.4										4.9	
Asheville	2,255	53	75	27.84	30.25	+ .10	46.0	+ 9.2	72	13	57	16	28	35	35	41	39	85	0.27	− 4.1	4	5,785	nw.	34	nw.	20	6	17	8	5.5	T.
Charlotte	773	68	76	29.39	30.25	+ .10	49.5	+ 8.3	77	15	58	21	24	40	27	44	40	76	0.51	− 4.6	7	5,478	sw.	31	sw.	12	12	6	13	5.5	T.
Hatteras	11	12	47	30.22	30.23	+ .09	49.6	+ 3.9	72	20	57	27	24	42	36	47	45	88	1.40	− 4.5	3	11,129	ne.	44	ne.	26	13	8	10	5.0	
Raleigh	376	71	79	29.84	30.26	+ .13	48.1	+ 7.3	79	15	58	16	24	38	33	42	36	70	1.23	− 2.4	7	4,671	sw.	25	sw.	20	9	11	11	5.5	0.9
Wilmington	78	81	91	30.18	30.26	+ .12	52.2	+ 5.3	78	13	62	21	24	42	33	46	42	78	0.92	− 3.0	5	5,367	sw.	35	sw.	20	15	9	7	4.2	
Charleston	48	14	92	30.21	30.26	+ .11	56.6	+ 6.6	78	14	65	31	29	49	25	50	48	83	0.88	− 3.1	5	7,008	sw.	32	sw.	20	12	12	7	4.3	
Columbia, S. C.	351	41	57	29.86	30.26	+ .11	53.2	+ 7.6	78	14	62	24	24	44	33	47	42	75	0.80	− 3.0	5	4,684	sw.	32	sw.	20	8	14	9	5.7	
Augusta	180	89	97	30.06	30.25	+ .09	54.7	+ 8.1	79	14	65	28	29	45	35	49	46	82	0.87	− 3.6	8	3,783	w.	30	w.	20	12	11	8	4.9	
Savannah	65	81	89	30.19	30.26	+ .11	59.0	+ 8.0	77	14	68	31	29	50	28	52	48	80	0.58	− 2.7	5	5,048	w.	22	sw.	19	13	13	5	4.4	
Jacksonville	43	101	129	30.21	30.26	+ .11	61.1	+ 5.9	77	13	70	38	29	52	27	56	54	89	0.14	− 3.1	3	5,563	ne.	26	sw.	20	14	11	6	4.4	
Florida Peninsula.							68.9	+ 4.2										79	0.46	− 2.4										3.4	
Jupiter	28	10	48	30.19	30.22	+ .12	70.0	+ 4.3	80	13	76	52	29	64	22	63	61	78	0.81	− 3.1	5	8,733	e.	31	w.	26	9	20	2	4.5	
Key West	22	10	53	30.16	30.18	+ .08	71.4	+ 1.7	80	13	76	63	10	67	11	65	63	80	0.11	− 2.0	6	8,162	ne.	24	e.	2	18	10	3	3.4	
Sand Key	25	41	71	30.13	30.16	+ .06	71.2	...	77	10	74	66	29	69	10	...	...	...	0.26	...	6	14,521	ne.	36	ne.	22	16	12	3	3.6	
Tampa	35	79	96	30.20	30.24	+ .12	65.4	+ 6.7	80	2	75	45	29	56	29	58	54	79	0.46	− 2.2	2	5,525	ne.	28	se.	25	25	5	1	2.1	
East Gulf States.							57.4	+ 9.5										80	2.37	− 2.6										5.4	
Atlanta	1,174	190	216	29.00	30.26	+ .11	52.0	+ 9.5	73	14	60	24	28	44	32	47	42	75	1.76	− 4.0	8	9,100	nw.	48	nw.	20	12	9	10	5.3	
Macon	370	55	66	29.86	30.26	+ .10	55.8	+ 9.6	78	18	66	28	22	46	31	...	...	...	1.78	− 1.2	7	3,044	sw.	19	nw.	20	12	9	10	4.7	
Thomasville	273	8	57	29.96	30.26	+ .10	59.9	+ 9.2	80	13	71	32	22	49	32	53	50	85	0.80	− 2.8	6	3,663	s.	20	sw.	19	13	11	7	4.4	
Pensacola	56	79	96	30.17	30.23	+ .09	60.5	+ 8.0	75	19	66	34	28	54	25	...	...	...	4.05	− 0.6	5	6,952	e.	36	nw.	20	9	10	12	5.6	
Anniston	741	9	58	29.47	30.28	+ .12	53.2	+11.5	77	13	63	20	28	44	30	...	...	...	3.15	− 2.0	9	4,502	se.	30	w.	19	8	9	14	6.1	
Birmingham	700	136	144	29.48	30.26	+ .10	54.2	+ 8.5	77	14	62	19	28	46	27	49	45	76	3.96	− 1.8	10	6,357	s.	29	s.	19	8	13	10	5.8	T.
Mobile	57	98	106	30.16	30.22	+ .07	60.5	+10.0	75	13	68	34	28	54	28	56	53	83	2.70	− 2.4	7	5,922	se.	34	nw.	20	9	8	14	5.5	
Montgomery	223	100	112	30.00	30.26	+ .10	57.0	+ 8.7	79	13	66	25	28	48	31	51	48	80	1.80	− 3.6	8	4,635	s.	34	w.	20	8	20	3	4.9	
Meridian	375	84	93	29.82	30.23	+ .07	56.2	+ 9.2	78	13	66	23	28	47	33	51	48	80	2.23	− 2.9	5	4,263	s.	30	nw.	20	12	9	10	5.2	
Vicksburg	247	62	74	29.93	30.21	+ .06	58.4	+11.1	79	13	67	26	28	50	27	53	49	75	1.69	− 3.8	6	5,743	se.	34	nw.	20	7	13	11	5.7	
New Orleans	51	88	121	30.15	30.21	+ .08	63.2	+ 9.4	81	13	70	38	28	56	22	58	56	85	2.14	− 3.0	9	6,641	s.	30	n.	20	4	12	15	6.5	
West Gulf States.							56.8	+10.4										80	2.11	− 1.2										6.4	
Shreveport	249	77	84	29.90	30.18	+ .04	57.2	+11.3	79	17	66	27	28	48	30	52	48	77	2.02	− 2.6	9	5,685	se.	37	w.	19	7	13	11	5.7	
Bentonville	1,303	11	44	28.73	30.16	+ .02	42.8	...	72	7	52	0	26	33	35	...	...	...	4.73	...	18	5,315	s.	32	sw.	19	7	3	21	7.4	2.2
Fort Smith	457	79	94	29.65	30.14	.00	48.0	+11.9	76	14	57	16	26	39	33	43	40	78	2.44	+ 0.1	12	6,835	e.	66	w.	19	8	1	22	7.2	0.2
Little Rock	357	93	100	29.80	30.19	+ .04	50.4	+ 9.6	76	14	59	18	26	42	34	47	43	80	8.27	+ 3.4	13	5,615	s.	48	nw.	19	6	3	22	7.0	0.1
Corpus Christi	20	48	53	30.10	30.12	+ .02	63.8	+ 8.3	78	19	69	36	26	58	32	60	58	84	0.27	− 2.6	5	8,573	se.	31	s.	12	6	18	7	5.3	
Fort Worth	670	106	114	29.40	30.12	.00	54.4	+ 9.4	81	11	65	20	26	44	34	...	...	...	0.51	− 1.4	5	8,176	s.	45	nw.	19	9	10	12	5.5	
Galveston	54	106	112	30.11	30.17	+ .04	62.1	+ 9.4	74	18	66	38	26	58	23	60	58	91	1.44	− 2.2	11	8,797	se.	46	nw.	19	8	13	10	5.9	
Palestine	510	73	79	29.60	30.13	+ .01	57.7	+13.9	80	13	66	28	26	49	29	52	48	77	1.13	− 3.2	9	6,522	s.	32	w.	19	6	6	19	7.1	
San Antonio	701	80	91	29.36	30.10	.00	60.5	+ 9.0	81	11	70	30	26	52	28	54	50	73	0.80	− 0.9	8	5,200	se.	36	nw.	19	6	12	13	6.3	
Taylor	583	55	63	29.50	30.12	+ .01	58.0	...	82	13	68	26	26	48	32	...	...	...	0.36	...	8	6,744	s.	32	s.	18	5	9	17	6.6	
Ohio Val. and Tenn.							41.3	+ 7.4										79	6.12	+ 1.9										7.5	
Chattanooga	762	106	112	29.44	30.27	+ .11	50.6	+ 9.6	75	14	59	20	28	42	30	46	42	76	1.33	− 4.9	12	5,505	s.	36	nw.	20	8	8	15	6.3	0.2
Knoxville	1,004	35	88	29.16	30.24	+ .09	48.2	+10.5	73	14	57	15	28	39	36	43	38	74	1.29	− 4.2	11	6,819	sw.	58	sw.	19	6	7	18	6.7	0.5
Memphis	399	76	97	29.79	30.22	+ .06	50.2	+10.3	73	19	58	18	26	42	32	47	44	82	2.89	− 2.6	14	7,559	s.	60	w.	19	7	9	15	6.6	0.3
Nashville	546	79	91	29.64	30.24	+ .08	48.8	+10.6	76	18	58	14	27	40	33	45	42	80	2.60	− 2.5	14	5,826	sw.	36	w.	20	5	7	19	7.2	1.4
Lexington	989	75	102	29.14	30.24	+ .11	40.4	+ 7.3	68	19	49	1	27	32	32	...	...	...	9.06	+ 5.2	17	9,324	s.	54	sw.	19	7	6	18	7.1	9.0
Louisville	525	111	132	29.62	30.22	+ .08	41.0	+ 6.9	74	19	50	4	26	32	35	38	35	79	12.11	+ 8.1	18	6,615	se.	49	sw.	20	4	6	21	7.8	6.5
Evansville	431	72	82	29.72	30.20	+ .06	40.2	...	68	19	48	5	26	32	30	...	...	...	8.70	...	17	6,185	s.	42	w.	19	4	8	19	7.4	2.6
Indianapolis	822	154	164	29.28	30.20	+ .08	34.2	+ 5.9	69	19	42	2	26	27	31	32	29	83	7.68	+ 4.7	20	7,826	se.	52	sw.	19	3	4	24	8.4	2.3
Cincinnati	628	152	160	29.52	30.22	+ .10	38.4	+ 5.9	72	19	47	4	26	30	36	36	32	83	8.40	+ 4.9	18	5,433	e.	42	sw.	19	3	3	25	8.4	2.3
Columbus	824	173	190	29.30	30.20	+ .09	33.5	+ 5.1	67	19	42	− 1	27	26	37	31	28	80	5.73	+ 2.4	18	9,076	nw.	66	nw.	20	3	10	18	7.9	5.2
Pittsburg	842	336	352	29.27	30.20	+ .09	34.7	+ 4.1	69	19	44	0	27	26	51	32	28	79	5.58	+ 2.4	20	7,894	ne.	62	w.	20	3	7	21	8.0	12.7
Parkersburg	638	77	84	29.54	30.22	+ .10	37.3	+ 4.3	71	19	47	− 6	28	28	44	35	31	81	7.90	+ 4.4	20	5,039	n.	34	w.	20	3	6	22	8.1	7.5
Elkins	1,940	41	50	28.10	30.22	+ .10	37.9	+ 8.1	71	19	48	− 1	27	27	46	34	31	81	8.93	+ 5.0	21	3,629	w.	31	w.	20	3	6	21	7.9	3.3
Lower Lake Region.							27.0	+ 1.6										85	4.18	+ 1.5											
Buffalo	767	178	206	29.30	30.17	+ .10	25.5	+ 1.1	62	20	32	− 1	24	19	45	24	21	85	4.23	+ 1.2	24	12,282	w.	84	sw.	20	1	8	22	8.5	10.0
Canton	448	10	71	29.68	30.19	...	12.8	...	58	20	23	−20	17	3	46	...	...	...	2.42	...	17	8,923	nw.	78	sw.	20	5	4	22	7.9	9.9
Oswego	335	76	91	29.81	30.20	+ .13	22.8	− 1.5	54	20	30	−10	24	16	31	21	19	87	3.81	+ 0.8	24	9,276	s.	46	sw.	20	0	5	26	8.8	15.7
Rochester	523	81	102	29.60	30.20	+ .13	24.8	+ 0.9	55	20	32	− 6	24	18	38	22	20	83	2.74	− 0.4	20	7,251	w.	54	w.	20	3	6	22	8.4	11.7
Syracuse	597	97	113	29.51	30.18	+ .11	22.8	...	55	20	30	−14	24	15	38	...	...	...	2.58	...	20	8,988	w.	57	sw.	20	2	9	20	7.8	15.6
Erie	713	92	102	29.38	30.18	+ .10	29.2	+ 2.3	65	19	36	− 3	24	22	50	27	24	82	4.51	+ 1.2	23	8,936	w.	42	w.	20	0	3	28	9.1	15.7
Cleveland	762	190	201	29.34	30.19	+ .10	29.5	+ 3.3	67	19	37	− 2	27	22	42	28	25	83	5.72	+ 3.2	18	12,049	w.	66	sw.	20	0	6	25	8.5	18.4
Sandusky	629	62	70	29.47	30.18	+ .09	29.6	+ 3.1	66	19	36	0	26	23	41	...	...	...	4.87	+ 2.7	19	6,647	sw.	38	w.	20	3	7	21	7.9	4.4
Toledo	628	207	246	29.49	30.20	+ .11	28.4	+ 2.3	65	19	36	− 2	26	21	41	27	24	86	3.78	+ 1.6	22	10,775	sw.	70	sw.	20	7	4	20	7.4	9.1
Detroit	730	153	193	29.36	30.19	+ .11	29.0	+ 1.5	60	19	32	− 2	26	20	41	25	22	86	3.87	+ 1.9	18	8,609	w.	54	sw.	20	5	4	22	7.5	12.7
Upper Lake Region.							18.1	0.0										84	2.56	+ 0.5										7.7	
Alpena	609	13	92	29.47	30.17	+ .13	20.1	+ 2.9	45	20	26	− 8	23	14	36	18	16	85	1.14	− 1.3	15	7,894	nw.	36	w.	20	2	8	21	8.2	10.1
Escanaba	612	40	82	29.48	30.18	+ .13	14.6	+ 0.6	37	3	22	−11	30	8	29	13	9	80	1.99	+ 0.4	17	7,423	nw.	38	nw.	20	7	8	16	6.3	12.9
Grand Haven	632	54	92	29.46	30.18	+ .11	23.8	− 0.4	50	19	29	4	25	19	27	22	20	85	4.18	+ 1.5	20	9,620	e.	48	sw.	20	1	3	27	9.0	14.1

TABLE I.—*Climatological data for U. S. Weather Bureau stations, January, 1907*—Continued.

Stations.	Elevation of instruments.			Pressure, in inches.			Temperature of the air, in degrees Fahrenheit.									Mean wet thermometer.	Mean temperature of the dew-point.	Mean relative humidity, per cent.	Precipitation, in inches.			Wind.					Clear days.	Partly cloudy days.	Cloudy days.	Average cloudiness during daylight, tenths.	Total snowfall.
																								Maximum velocity.							
	Barometer above sea level, feet.	Thermometers above ground.	Anemometer above ground.	Actual, reduced to mean of 24 hours.	Sea level, reduced to mean of 24 hrs.	Departure from normal.	Mean max. + mean min. ÷ 2.	Departure from normal.	Maximum.	Date.	Mean maximum.	Minimum.	Date.	Mean minimum.	Greatest daily range.				Total.	Departure from normal.	Days with .01, or more.	Total movement, miles.	Prevailing direction.	Miles per hour.	Direction.	Date.					
Up. Lake Reg—Cont.																															
Grand Rapids	707	121	162	29.38	30.18	+.12	23.7	−0.1	56	19	30	1	26	18	27	23	21	90	3.74	+0.8	22	7,751	nw.	50	w.	19	2	3	26	8.7	13.1
Houghton	668	66	74	29.39	30.16	+.11	12.3	....	34	3	18	−20	30	6	24	....	....	....	2.82	....	26	5,417	nw.	27	se.	2	1	5	25	8.9	36.4
Marquette	734	77	116	29.33	30.17	+.13	14.2	−1.8	38	3	20	−10	21	8	22	13	8	78	1.76	−0.3	20	8,075	w.	35	sw.	10	4	8	19	7.7	17.4
Port Huron	638	70	120	29.46	30.18	+.12	23.6	−1.8	60	19	30	−5	26	17	39	22	20	85	3.06	+1.0	16	8,624	w.	58	w.	20	5	7	19	7.4	10.0
Sault Ste. Marie	614	40	61	29.45	30.19	+.16	11.4	−2.9	36	19	18	−21	23	5	33	11	8	87	2.26	+0.5	17	6,824	e.	46	w.	20	5	3	23	8.1	17.9
Chicago	823	140	310	29.27	30.19	+.09	27.8	+4.4	59	7	34	−3	26	21	31	26	24	86	4.21	+2.1	19	10,662	nw.	60	w.	20	6	5	20	7.6	10.9
Milwaukee	681	122	142	29.43	30.20	+.12	22.4	+3.0	50	19	29	−9	26	16	31	20	18	85	2.54	+0.4	15	8,648	w.	39	w.	10	6	4	21	7.3	11.3
Green Bay	617	49	86	29.47	30.17	+.11	15.2	+1.0	43	19	22	−16	23	8	31	14	10	80	2.17	+0.3	16	7,571	w.	41	w.	20	5	6	20	7.4	13.8
Duluth	1,133	11	47	28.89	30.20	+.11	2.7	−7.3	32	2	12	−28	28	−6	35	2	0	88	1.07	0.0	13	10,644	w.	48	nw.	20	7	12	12	5.7	13.2
North Dakota.							−4.9	−7.4										85	1.13	+0.5										6.0	
Moorhead	940	8	57	29.18	30.28	+.14	−2.4	−1.5	35	2	7	−28	15	−12	39	−3	−5	90	1.50	+0.8	13	7,091	nw.	34	se.	2	8	10	13	5.6	17.4
Bismarck	1,674	8	57	28.35	30.28	+.15	−3.2	−7.7	25	23	6	−35	15	−12	44	−4	−8	79	1.01	+0.4	10	7,930	nw.	50	nw.	19	9	10	12	5.8	14.7
Devils Lake	1,482	11	44	28.52	30.24	+.12	−10.8	....	22	2	−1	−37	15	−21	42	−11	−15	80	1.67	....	9	9,192	w.	38	nw.	10	7	9	15	6.3	17.3
Williston	1,875	14	44	28.09	30.23	+.12	−9.0	−12.9	25	31	2	−42	15	−19	40	−8	−10	90	1.03	+0.4	10	6,427	n.	48	n.	23	7	13	11	6.3	10.3
Upper Miss. Valley.							22.7	+2.4										86	3.46	+1.7										7.5	
Minneapolis	....	102	208	....	....	....	7.4	−4.5	37	4	15	−18	26	−1	35	....	....	....	0.93	+0.1	12	8,594	w.	37	w.	19	7	5	19	6.9	12.8
St. Paul	837	171	179	29.25	30.21	+.10	7.5	−3.1	38	5	16	−20	26	−1	36	7	4	83	0.81	−0.2	11	7,671	nw.	45	w.	19	3	8	20	8.2	7.5
La Crosse	714	71	87	29.39	30.21	+.10	14.0	−0.7	42	5	22	−15	30	6	32	....	....	....	1.61	+0.3	11	5,341	n.	33	w.	19	5	8	18	7.4	10.9
Madison	974	70	78	29.08	30.20	+.10	17.0	+0.5	47	19	24	−12	26	10	32	16	14	89	1.89	+0.2	10	7,042	nw.	38	w.	20	6	4	21	7.5	6.7
Charles City	1,015	8	58	29.08	30.22	+.08	13.8	−2.7	39	5	21	−20	30	6	34	13	12	92	1.13	+0.1	8	6,541	nw.	36	nw.	19	3	9	19	7.9	8.4
Davenport	606	71	79	29.51	30.20	+.08	24.1	+4.1	49	19	31	−5	26	17	33	23	21	86	3.55	+1.8	12	5,865	nw.	38	nw.	19	8	4	19	7.2	9.8
Des Moines	861	84	101	29.27	30.22	+.08	20.4	+2.9	48	5	28	−7	30	12	37	19	17	83	0.87	−0.5	9	6,072	nw.	28	nw.	19	2	10	19	8.0	5.3
Dubuque	698	100	117	29.44	30.23	+.11	19.8	+2.5	49	19	27	−8	26	12	41	19	17	88	1.72	0.0	10	5,405	nw.	26	w.	20	5	7	19	7.1	4.4
Keokuk	614	64	77	29.51	30.22	+.08	28.9	+5.7	68	7	37	−2	26	21	32	26	23	83	5.07	+3.4	12	5,347	nw.	36	nw.	19	4	13	14	6.6	6.9
Cairo	356	87	93	29.81	30.21	+.05	43.4	+8.7	71	18	52	10	26	35	33	41	38	85	7.77	+4.0	14	7,773	n.	43	w.	19	3	6	22	7.9	5.3
La Salle	536	56	64	29.62	30.22	+.11	26.2	....	59	7	33	−4	26	19	30	....	....	....	4.46	....	15	6,203	nw.	42	w.	20	7	4	20	7.5	8.5
Peoria	609	11	45	29.51	30.20	+.08	28.0	....	63	7	36	−4	26	21	25	26	23	83	5.39	....	13	6,740	nw.	51	w.	20	6	4	21	7.5	8.5
Springfield, Ill.	644	10	92	29.48	30.19	+.06	32.2	+6.7	70	7	40	2	26	24	36	29	26	82	6.17	+4.1	15	6,999	nw.	36	sw.	19	4	4	23	7.8	2.8
Hannibal	534	75	109	29.60	30.20	+.07	30.9	+5.0	71	7	39	2	26	23	35	....	....	....	5.17	+2.9	14	6,663	n.	40	w.	19	4	7	20	7.6	5.8
St. Louis	567	208	217	29.56	30.18	+.04	36.2	+5.7	67	7	45	6	26	28	34	34	32	87	7.35	+5.2	16	8,051	s.	52	w.	19	7	7	17	6.7	2.2
Missouri Valley.							20.8	+0.5										81	2.21	+1.2										7.2	
Columbia, Mo.	784	11	84	29.30	30.16	+.03	33.6	+3.0	72	6	42	5	26	25	34	....	....	....	5.65	+3.4	16	6,488	se.	44	w.	19	5	6	20	7.6	4.5
Kansas City	963	78	95	29.13	30.21	+.06	31.1	+5.7	70	7	39	7	26	23	32	29	26	83	4.54	+3.4	13	4,670	nw.	39	nw.	19	5	6	20	7.4	2.5
Springfield, Mo	1,324	98	104	28.71	30.15	+.01	39.3	+7.0	71	7	48	8	26	30	35	36	34	85	6.41	+3.9	21	8,104	se.	53	sw.	19	7	3	21	7.5	1.6
Iola	984	40	47	29.08	30.18	+.04	35.0	....	70	7	43	7	27	27	30	....	....	....	6.11	....	18	6,236	ne.	34	nw.	19	4	4	23	8.2	1.4
Topeka	....	85	89	....	....	....	30.0	+3.2	63	5	38	8	26	22	32	....	....	....	3.08	+2.1	12	6,341	n.	36	nw.	19	3	8	20	7.6	1.0
Lincoln	1,189	11	84	28.86	30.19	+.04	21.8	−0.3	50	21	30	−5	30	14	38	20	15	75	0.61	0.0	9	7,611	n.	48	nw.	19	8	5	18	7.1	2.9
Omaha	1,105	115	121	28.97	30.21	+.06	20.3	+1.1	49	2	28	−7	30	12	35	19	15	77	0.53	−0.2	10	7,055	n.	41	nw.	19	4	6	21	7.9	3.6
Valentine	2,598	47	54	27.32	30.19	+.07	14.6	−2.3	56	23	27	−12	3	3	45	11	9	85	0.36	−0.2	6	7,381	nw.	54	nw.	19	8	16	7	5.3	5.1
Sioux City	1,135	96	164	28.93	30.22	+.07	15.0	−1.3	45	21	24	−14	30	6	39	....	....	....	0.41	−0.2	5	10,374	nw.	66	nw.	19	4	7	20	7.6	6.4
Pierre	1,572	70	75	28.46	30.25	+.12	6.0	−6.7	41	4	15	−16	9	−3	37	4	0	78	0.85	+0.3	11	6,310	nw.	48	nw.	19	10	8	13	5.7	11.1
Huron	1,306	56	67	28.76	30.26	+.10	4.2	−2.8	37	2	14	−21	15	−6	40	3	1	86	1.22	+0.7	11	9,086	nw.	50	s.	2	7	12	12	6.1	11.2
Yankton	1,233	49	57	28.83	30.23	+.07	12.8	−1.4	46	4	22	−20	30	4	40	....	....	....	0.60	0.0	9	6,872	nw.	39	nw.	19	2	6	23	8.2	7.1
Northern Slope.							11.6	−5.9										80	0.84	+0.2										5.9	
Havre	2,505	11	44	27.40	30.27	+.17	−8.3	−17.7	37	21	4	−43	15	−20	56	−10	−12	88	1.73	+0.8	13	4,683	e.	36	sw.	23	8	9	14	6.2	18.3
Miles City	2,371	26	48	27.58	30.26	+.14	2.8	−7.8	43	23	13	−33	14	−8	54	1	−2	82	1.28	+0.7	14	3,510	ne.	32	n.	11	5	14	12	5.8	11.9
Helena	4,110	8	56	25.74	30.18	+.03	6.9	−10.2	47	21	16	−21	14	−2	46	6	2	80	1.29	−0.1	11	3,610	nw.	36	w.	31	8	7	16	6.7	16.1
Kalispell	2,962	8	34	26.89	30.12	.00	11.8	....	42	22	19	−19	15	4	27	10	8	86	2.01	....	17	3,490	w.	23	sw.	31	3	10	18	7.2	15.1
Rapid City	3,234	46	50	26.57	30.21	+.11	12.4	−7.8	53	23	23	−16	14	2	48	10	6	80	0.31	0.0	10	4,582	e.	36	sw.	4	15	7	9	4.7	2.9
Cheyenne	6,088	56	64	23.87	30.00	−.05	28.3	+3.3	58	23	39	2	14	17	38	23	16	65	0.42	0.0	5	8,484	w.	49	nw.	19	11	12	8	5.1	4.2
Lander	5,372	26	36	24.51	30.06	−.06	19.4	−0.5	52	4	32	−12	15	7	42	16	12	76	0.48	+0.1	5	2,686	ne.	34	sw.	7	10	15	6	4.7	4.8
Yellowstone Park	6,200	11	48	23.71	30.06	−.08	14.8	....	38	23	23	−19	14	6	32	13	9	77	2.44	....	16	6,626	s.	39	sw.	4	5	8	18	7.2	28.3
North Platte	2,821	11	51	27.11	30.19	+.07	19.6	−0.4	58	23	30	−4	30	10	42	17	15	90	0.39	−0.1	9	5,438	ne.	41	sw.	2	10	6	15	5.7	3.8
Middle Slope.							33.2	+4.2										76	1.02	+0.3										6.1	
Denver	5,291	129	136	24.62	30.02	−.03	31.8	+3.6	68	23	45	4	3	18	43	25	19	69	0.46	−0.1	7	5,202	s.	38	w.	11	7	19	5	4.8	8.3
Pueblo	4,685	80	86	25.20	29.97	−.08	34.9	+6.2	67	23	48	10	3	21	48	27	16	52	0.28	−0.1	6	5,849	nw.	46	nw.	19	19	7	5	3.3	3.4
Concordia	1,398	42	47	28.64	30.18	+.04	25.8	+2.6	49	10	32	3	30	19	29	24	21	83	0.72	+0.1	8	4,905	n.	28	nw.	19	4	10	17	7.3	2.3
Dodge	2,509	44	54	27.43	30.13	+.02	31.6	+5.0	63	11	43	5	30	20	35	27	23	80	0.28	−0.2	9	6,662	se.	36	nw.	19	2	12	17	7.3	1.2
Wichita	1,358	78	86	28.69	30.17	+.04	33.6	+3.0	66	7	42	8	27	25	32	31	28	83	2.97	+2.0	14	6,742	ne.	39	nw.	19	5	11	15	7.3	3.0
Oklahoma	1,214	10	47	28.80	30.12	+.01	41.7	+4.7	73	7	51	15	27	32	36	38	36	86	1.42	0.0	9	12,043	s.	58	s.	19	8	7	16	6.6	0.1
Southern Slope.							51.5	+9.2										72	0.97	+0.2										5.1	
Abilene	1,738	45	54	28.27	30.10	+.01	53.0	+10.2	82	11	65	18	26	42	38	45	40	72	1.44	+0.5	8	6,695	s.	39	nw.	19	7	14	10	5.6	
Amarillo	3,676	10	49	26.25	30.04	−.02	42.4	+10.5	74	5	56	15	25	29	46	35	31	74	1.11	+0.4	9	9,467	s.	39	sw.	11	15	12	4	4.1	0.9
Del Rio	944	8	57	29.08	30.08	+.02	59.2	....	87	11	70	28	4	48	35	....	....	....	0.07	....	5	6,160	se.	46	nw.	19	8	19	4	4.9	
Roswell	3,578	9	57	26.32	29.99	−.05	45.9	+6.8	72	14	60	21	4	32	48	39	33	69	0.36	−0.2	6	4,515	s.	42	n.	19	9	8	14	5.7	
Southern Plateau.							41.5	+1.2										70	1.22	+0.3										4.4	
El Paso	3,762	10	110	26.22	30.02	+.01	50.2	+5.7	72	17	63	23	4	38	39	41	33	60	0.42	−0.1	8	6,045	nw.	44	w.	19	12	12	7	4.7	0.1
Santa Fe	7,013	33	39	23.21	30.06	+.02	32.9	+5.0	51	22	41	5	2	24	27	28	24	71	2.18	+1.6	10	5,397	ne.	31	n.	4	14	11	6	4.2	7.9
Flagstaff	6,907	12	44	23.29	30.02	−.05	26.6	0.0	53	23	39	−10	2	15	49	24	21	82	2.21	+0.2	12	5,351	sw.	34	s.	6	9	7	15	6.1	26.0
Phoenix	1,108	50	56	28.87	30.05	+.02	51.7	+1.9	73	22	62	30	3	41	33	45	39	66	1.15	+0.4	5	2,318	e.	29	sw.	6	12	13	6	4.8	
Yuma	141	16	46	29.90	30.05	.00	53.8	−0.4	78	28	65	34	2	42	32	46	38	60	0.39	0.0	3	4,237	n.	27	w.	6	20	9	2	2.2	
Independence	3,910	11	42	25.96	30.02	−.05	33.6	−4.8	57	4	43	11	19	24	39	31	27	78	0.95	−0.3	3	4,026	nw.	40	n.	1	17	5	9	4.2	11.4
Middle Plateau.							30.0	+0.9										79	1.40	+0.3										6.3	
Reno	4,532	56	63	25.38	30.04	−.09	28.2	−2.6	54	28	38	−4	16	18	33	26	23	83	1.28	−0.2	10	2,964	sw.	42	e.	4	5	19	7	5.5	16.2
Tonopah	6,089	12	20	23.97	30.13	....	27.2	....	44	22	32	11	1	22	17	25	21	80	1.19	....	10	7,468	se.	44	se.	8	6	15	10	5.6	17.0
Winnemucca	4,344	18	56	25.55	30.04	−.12	27.0	0.0	50	28	36	−5	16	18	35	24	22	83	1.16	0.0	13	6,462	ne.	36	sw.	4	7	13	11	6.3	16.5
Modena	5,479	10	43	24.55	30.05	−.05	24.0	−0.1	46	26	34	−8	2	14	37	23	21	89	1.63	+1.0	13	8,678	w.	50	sw.	15	8	9	14	5.7	14.7
Salt Lake City	4,366	105	110	25.68	30.08	−.02	30.6	+2.7	50	29	37	10	23	24	21	28	24	76	1.75	+0.3	11	4,185	se.	36	nw.	13	2	5	24	8.2	24.8
Durango	6,546	18	56	23.61	30.07	+.02	29.0	+2.3	52	22	39	−9	3	19	36	25	21	75	2.15	+0.9	16	3,417	nw.	26	nw.	19	9	4	18	6.1	10.5
Grand Junction	4,608	43	51	25.36	30.00	−.06	29.0	+0.0	53	6	44	12	3	26	30	29	23	66	0.44	−0.2	8	3,006	nw.	34	sw.	6	6	7	18	6.6	1.2
Northern Plateau.							24.4	−2.3										82	1.31	−0.1										7.4	
Baker City	3,471	48	58	26.36	30.04	−.12	23.3	+0.5	49	31	31	−2	14	16	26	22	19	83	1.92	+0.3	17	4,206	s.	34	s.	3	3	12	16	6.9	17.7
Boise	2,739	78	86	27.14	30.04	−.11	28.0	+2.8	54	31	36	13	17	24	18	27	23	75	1.45	−0.9	17	3,648	se.	30	se.	3	5	6	20	7.5	9.6
Lewiston	757	10	51	29.23	30.07	−.09	25.7	−10.2	49	31	31	−2	17	20	21	....	....	....	2.04	+0.9	16	3,260	e.	36	w.	31	3	4	24	8.5	18.0
Pocatello	4,477	46	54	25.42	30.08	−.12	24.5	+5.4	49	29	32	−2	16	17	26	22	19	78	1.24	−0.8	15	6,468	se.	38	s.	6	5	12	14	6.2	14.8
Spokane	1,929	101	110	27.94	30.08	−.04	18.8	−5.7	44	31	25	−3	19	13	23	19	16	83	2.27	−0.3	17	3,975	ne.	40	sw.	31	4	4	23	7.7	17.1
Walla Walla	1,000	71	79	28.99	30.10	−.05	23.8	−6.7	59	21	30	−1	17	18	38	23	22	92	2.52	+0.1	16	3,587	s.	40	se.	3	1	12	18	7.9	16.7
N. Pac. Coast Reg.							35.1	−4.1										79	5.68	−1.8										6.5	
North Head	211	11	56	29.69	29.92	−.13	38.4	−2.5	57	22	43	17	14	34	19	36	32	77	5.64	−2.9	16	11,728	e.	84	se.	3	11	7	13	5.4	1.0
Port Crescent	259	12	29	29.68	29.97	−.02	31.8	−3.7	53	20	37	8	15	27	19	....	....	....	3.66	−3.4	12	6,171	se.	44	ne.	13	6	10	15	6.5	8.4
Seattle	123	185	224	29.86	30.00	−.05	33.8	−7.0	53	21	39	11	15	29	17	32	29	79	4.18	−0.4	15	5,670	n.	39	s.	31	10	6	15	6.3	12.2
Tacoma	213	113	120	29.74	29.97	−.07	33.6	−4.4	55	21	39	9	15	28	19	....	....	....	3.92	−2.5	15	5,479	sw.	30	ne.	8	6	8	17	6.7	4.4
Tatoosh Island	86	7	57	29.82	29.92	−.06	36.6	−4.0	49	24	40	21	14	33	14	34	32	72	8.20	−4.5	12	20,749	e.	65	ne.	14	9	9	13	6.0	6.5
Portland, Oreg.	153	68	106	29.83	29.99	−.06	34.0	−4.4	55	31	39	13	15	29	18	32	28	78	8.23	+1.1	17	6,470	e.	37	sw.	3	8	4	19	6.7	1.6
Roseburg	510	9	57	29.41	29.97	−.13	37.8	−2.5	58	29	44	18	14	31	28	36	34	87	5.90	−0.3	19	1,929	s.	18	sw.	31	4	7	20	7.9	3.9

TABLE I.—*Climatological data for U. S. Weather Bureau stations, January, 1907*—Continued.

Stations.	Elevation of instruments.			Pressure, in inches.			Temperature of the air, in degrees Fahrenheit.									Mean wet thermometer.	Mean temperature of the dew-point.	Mean relative humidity, per cent.	Precipitation, in inches.			Wind.					Clear days.	Partly cloudy days.	Cloudy days.	Average cloudiness during daylight, tenths.	Total snowfall.
	Barometer above sea level, feet.	Thermometers above ground.	Anemometer above ground.	Actual, reduced to mean of 24 hours.	Sea level, reduced to mean of 24 hrs.	Departure from normal.	Mean max. + mean min. ÷ 2.	Departure from normal.	Maximum.	Date.	Mean maximum.	Minimum.	Date.	Mean minimum.	Greatest daily range.				Total.	Departure from normal.	Days with .01, or more.	Total movement, miles.	Prevailing direction.	Maximum velocity. Miles per hour.	Maximum velocity. Direction.	Maximum velocity. Date.					
Mid. Pac. Coast Reg.							45.7	− 1.3										84	6.21	+ 0.8										7.3	
Eureka	62	62	80	29.93	30.00	− .10	46.4	+ 0.4	60	29	52	33	14	41	19	44	41	82	10.40	+ 2.8	24	4,631	s.	36	n.	12	3	8	20	7.6	
Mount Tamalpais	2,375	11	18	27.51	30.02	− .09	39.4		58	22	42	28	15	36	15	38	36	90	6.28		21	14,158	se.	56	se.	4	5	3	23	7.9	
Point Reyes Light	490	7	18	29.46	29.98		47.5	− 1.1	67	22	52	34	15	44	18				5.50	− 0.6	25	15,134	s.	66	sw.	16	5	10	16	6.9	
Red Bluff	332	50	56	29.66	30.03	− .09	42.3	− 2.6	62	22	48	27	18	36	28	40	38	85	6.10	+ 1.4	15	4,085	nw.	36	se.	4	3	2	26	8.3	
Sacramento	69	106	117	29.97	30.05	− .07	45.3	− 0.3	61	29	50	31	6	40	21	43	40	83	4.63	+ 0.8	17	6,319	se.	40	s.	17	7	5	19	7.0	
San Francisco	155	200	204	29.87	30.04	− .07	47.1	− 3.0	61	22	51	36	13	43	16	44	42	82	4.41	− 0.3	21	5,931	s.	32	se.	8	5	6	20	7.2	
San Jose	141	78	88	29.89	30.05		46.6		64	28	54	28	6	39	30				4.61		19		se.				6	4	21	6.9	
Southeast Farallon	30	9	17	29.99	30.02		49.0		59	22	52	38	15	46	11				4.48		21	11,913	s.	58	s.	16	7	7	17	6.8	
S. Pac. Coast Reg.							50.0	− 0.6										79	5.60	+ 2.8										6.4	
Fresno	330	67	70	29.70	30.06	− .04	46.6	+ 2.1	65	31	54	30	21	39	29	44	40	81	3.34	+ 2.0	14	3,178	se.	24	se.	7	8	1	22	7.4	
Los Angeles	338	116	123	29.69	30.06	− .02	51.6	− 1.5	77	22	59	35	2	44	28	46	41	72	7.02	+ 4.1	16	3,479	ne.	23	s.	7	4	13	14	6.7	
San Diego	87	94	102	29.96	30.06	− .01	52.8	− 0.8	73	21	59	35	2	46	23	48	45	78	3.27	+ 1.2	13	4,320	nw.	33	nw.	1	14	3	14	5.3	
San Luis Obispo	201	47	54	29.85	30.07	− .02	49.0	− 2.1	74	22	57	30	6	41	37	46	44	85	8.78	+ 4.1	16	3,519	nw.	24	se.	8	9	2	20	6.4	
West Indies.																															
Grand Turk	11	6	20	30.11	30.12	+ .09	74.2		84	28	81	62	24	68					2.77		20		e.								
San Juan	82	48	90	29.98	30.06	+ .04	73.4	− 1.8	80	10	78	63	30	69	13	67	64	73	3.64	+ 0.7	22	10,512	ne.	32	ne.	1	13	16	2	3.8	
Panama.																															
Ancon	74																														
Naos	40																														

TABLE II.—*Climatological record of cooperative observers, January, 1907.*

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
	°	°	°	*Ins.*	*Ins.*
Alabama.					
Alaga				1.18	
Ashville	75	20	50.9	1.91	
Auburn	74	25	55.2	2.14	
Bermuda	79	26	57.2	2.20	
Boligee	80	23	57.2	2.07	
Bridgeport				1.35	
Camphill				2.69	
Cedar Bluff				2.30	T.
Citronelle	80	27	60.4	2.47	
Clanton	79	20	54.2	2.06	
Cordova	80	20	53.4	2.75	
Daphne	81	32	61.4	2.65	
Decatur	79	17	51.2	1.04	T.
Demopolis				1.78	
Eufaula	74	26	54.4	1.89	
Flomaton	80	27	57.9	2.30	
Florence	78	16	52.8	3.24	T.
Fort Deposit	77	24	53.7	2.72	
Gadsden	80	21	53.0	1.50	
Goodwater	80	21	53.8	2.55	
Greensboro	77	23	55.8	2.37	
Guntersville				1.04	
Hamilton	78[j]	20	52.4[e]	1.77	
Highland Home	78	24	57.8	1.75	
Livingston	75	21	52.9	3.54	
Lock No. 4	76	21	52.2	2.54	
Lucy	81[e]	27[e]	58.7[e]	1.12	
Maplegrove	77	20	49.6	2.06	
Milstead				2.44	
Newbern	80	22	55.8	2.35	
Oneonta	76	17	51.4	2.13	
Opelika	80	22	55.6	2.19	
Prattville				2.17	
Pushmataha	84	24	56.6	3.13	
Riverton	76	13	49.2	1.82	0.4
Scottsboro	74	19	51.6	1.74	
Selma	81	25	57.2	1.13	
Spring Hill				3.00	
Talladega	82	21	55.4	2.23	
Thomasville	78	23	54.7		
Tuscaloosa	79	20	52.6	2.17	
Tuscumbia	75	19	51.6	1.57	
Tuskegee	81	24	57.4	1.31	
Union Springs	78	24	56.2	2.05	
Uniontown	80	23	56.2	1.87	
Valleyhead	77	17	49.5	2.67	
Vienna				2.32	
Wetumpka	84	23	57.0	2.17	
Alaska.					
Juneau	43	2	22.7	8.88	34.0
Killisnoo	36	5	19.4	1.40	14.0
Loring	34	−14	13.0	0.53	15.0
Sitka	44	7	27.4	2.36	10.0
Skagway	40	− 4	15.0	0.46	
Wood Island	45	22	34.6	1.00	2.0

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
	°	°	°	*Ins.*	*Ins.*
Arizona.					
Allaire Ranch				2.52	3.2
Aztec	78	28	53.8	1.34	
Benson	72	22	47.8	2.56	3.5
Bisbee	64	22	45.7	5.36	6.0
Bonita				4.48	14.0
Bowie	72	22	47.0	3.53	10.0
Buckeye	76	25	50.2	1.06	T.
Chiarsons Mill	47	7	24.5	6.05	44.0
Clifton				2.65	3.0
Cline	71	26	48.1	3.08	3.0
Cochise *[1]	60	25	43.6	2.93	0.7
Columbia	70	27	47.0	2.05	1.0
Congress	68	28	47.0	2.77	7.0
Douglas	73	22	49.1	1.94	0.0
Dudleyville	76	27	50.2	2.68	2.4
Flagstaff	53	0	27.0	3.47	44.0
Fort Apache	66	6	40.1	2.15	10.0
Fort Huachuca	66	22	45.3	4.80	1.0
Fredonia	53	7	34.9	1.60	10.0
Gilabend	74	30	54.3	1.83	
Globe	67	18	45.6	2.46	7.0
Grand Canyon	55	4	29.6	3.30	29.0
Greaterville	71	11	41.3	4.14	4.0
Greer				3.98	39.8
Holbrook	64	12	38.8	1.64	1.0
Huachuca Reservoir				15.96	22.0
Jerome	59	19	41.0	2.60	10.0
Keams Canyon	54	− 2	33.3	1.14	6.0
Kingman	67	9	42.1	3.74	4.0
Maricopa	74	30	50.4	1.36	
Mesa	76	32	52.4	1.07	T.
Mohawk Summit *[1]	75	40	55.8	0.40	
Natural Bridge				4.27	19.0
Nutrioso				1.58	15.5
Oracle	64	25	45.9	3.11	11.0
Paradise	68	11	43.4	3.01	8.0
Parker	77	21	51.1	0.13	
Phoenix (Ex. Farm)	75	27	50.7	1.56	
Picacho *[5]	70	35	55.0	1.02	
Pinal Ranch				3.39	9.5
Pinto				1.35	6.5
Prescott	66	0	34.2	3.06	21.0
Roosevelt				1.85	T.
St. Michaels	49	− 9	30.8	0.89	2.9
San Carlos	71[1]	25	48.0[e]	2.00	T.
San Simon	70	20	44.8	2.52	1.0
Seligman	60	− 3	34.6	2.46	8.0
Sentinel	77	29	53.5	1.27	
Showlow	68	15	41.6	3.07	20.5
Signal	72	26	46.7	2.02	
Silverbell	66	31	46.8	1.56	1.0
Tempe	73	27	51.0	1.52	
Thatcher	71	24	46.6	1.45	5.5
Tombstone	65	25	46.3	3.38	7.0
Tuba	60	13	37.2	2.00	14.8
Tucson	76	26	51.4	1.76	1.0

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
	°	°	°	*Ins.*	*Ins.*
***Arizona*—Cont'd.**					
Upper San Pedro	73	22	47.6	2.75	7.5
Vail *[5]	60	38	45.9	2.01	4.0
Walnut Grove				2.82	7.0
Willcox	69	20	43.4	3.72	8.5
Yarnell				4.46	20.0
Young	68	0	37.8	2.35	10.0
Arkansas.					
Alicia	76	12	47.4	6.57	3.6
Amity	76	21	52.2	8.56	T.
Arkadelphia	78	20	51.7	7.58	T.
Arkansas City				2.38	
Batesville	78	9	47.8		
Beebranch				3.35	1.0
Black Rock				7.97	2.0
Brinkley	79	19	50.1	5.59	0.5
Calico Rock				4.54	2.0
Camden	77	23	55.0	5.98	
Center Point	78	20	53.8	6.15	
Clarendon				6.37	0.5
Conway	77	15	49.8	8.41	0.5
Corning	74	7	46.2	8.29	2.3
Dardanelle				4.88	0.5
Des Arc	79	19	50.6	10.08	0.5
Dodd City	75	− 1	45.4	4.39	1.8
Dutton	69	10	44.8	5.45	1.0
Earl	75	20	49.8	6.80	1.5
Eldorado	78	23	54.4	4.05	0.8
Eureka Springs	73	0	44.5	5.48	3.0
Fayetteville	72	8	45.5	4.82	1.7
Forrest City	76	18	49.7	5.06	1.0
Fulton				6.43	
Hardy	76	8	46.3	7.29	1.1
Harrison	75	− 2[e]	43.6[e]	4.23	1.5
Helena	76	23	53.2	2.24	1.0
Hope	79	22	54.4	8.63	
Hot Springs	75	18	50.4	10.01	T.
Jonesboro	76[f]	9	48.0[e]	8.06	0.2
Junction	77	22	54.2	2.88	
La Crosse	76	7	47.4	4.69	1.0
Lewisville	78	22	54.8	6.26	T.
Lutherville	77	12	48.2	4.25	1.0
Luxora				4.18	
Malvern	74	18	48.0	11.80	
Mammoth Springs	76	9	44.5	5.23	1.8
Marked Tree				7.87	2.0
Marvell	78	21	52.0	2.73	T.
Mena	72	17	50.8	3.29	
Montrose	79	23	54.6	1.95	
Mount Nebo	73	10	46.5	3.86	T.
Mossville	69	6	43.2	6.07	9.0
Newport	76	10	47.0	9.11	1.0
Ozark	78	13	49.0	4.13	1.0
Pinebluff	82	21	52.0	6.44	
Pocahontas	76	10	48.0	8.51	0.1
Pond	73	− 8	42.8	4.37	1.0
Prescott	77	22	51.5	7.00	T.

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TABLE II.—*Climatological record of cooperative observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Arkansas—Cont'd.	°	°	°	*Ins.*	*Ins.*
Princeton	77	21	53.0	9.62	
Rogers	74	−1	44.3	3.55	3.5
Russellville	78	16	47.6	3.97	
Spielerville	77	16	48.7	3.51	0.5
Stuttgart	77	18	51.3	5.36	T.
Texarkana	85	25	57.1	2.50	
Warren	78	22	52.4	4.56	
Wiggs	75	11	50.2	10.66	T.
Witts Springs[g]	69	7	42.8		
California.					
Alturas	47	−8	25.5	1.35	10.0
Angiola	74	20	46.2	3.03	
Auburn	64	27	46.5	8.35	9.0
Azusa	77	27	48.2	11.36	
Bagdad	68	30	50.7	0.90	
Bear Valley				14.59	100.0
Berkeley	58	34	46.6	5.02	T.
Bishop	59	1	33.0	1.80	18.0
Blocksburg	60	24	40.8	16.53	17.5
Blue Canyon	63	12	35.1	13.18	76.0
Bodie	52	−7	23.5	1.35	13.5
Branscomb	67	20	39.6	18.58	27.5
Brush Creek	56	18	35.3	16.21	58.5
Butte Valley				11.96	
Calexico	74	32	52.0	0.24	
Campbell	63	28	46.1	4.76	
Campo				5.24	3.0
Cedarville	50	3	24.9	1.99	29.0
Chico	65	24	43.2	6.28	6.0
Claremont	75	26	48.8	8.40	
Cloverdale	65	28	44.5	10.69	12.2
Colfax	67	14	37.3	9.45	36.0
Colusa	61	29	43.6	5.63	
Crescent City	55	30	44.2	16.97	6.0
Crockers				13.49	90.0
Cuyamaca	54	12	32.0	9.48	19.0
Delta	72	21	44.0	12.26	35.0
Diamond				7.56	1.0
Dobbins	62	27	45.0	10.54	9.0
Durham	70	22	44.0	6.45	2.0
Elcajon	78	29	51.4	4.35	
Electra	65	32	48.0	7.47	3.0
Elmwood	68	28	46.7	3.60	
Elsinore	72	26	45.5	4.80	
Emigrant Gap	52	2	26.4	14.35	102.0
Escondido	72	22	48.0	4.96	
Folsom	64	28	45.8	5.25	T.
Fordyce				12.11	138.0
Fort Bragg				6.60	2.0
Fort Ross	68	31	47.0	15.04	T.
Georgetown	64	16	38.6	8.96	20.0
Gold Run	60	23	37.0	10.47	43.0
Greenville	54	4	31.4	9.57	54.0
Groveland				9.66	3.0
Healdsburg	65	25	45.0	13.37	3.5
Heber	81	28	53.4	0.11	
Hollister	70	26	46.9	5.75	T.
Idyllwild	61	6	34.6	7.30	50.0
Indio	80	30	52.7	0.59	
Iowa Hill	65	18	39.4	11.52	38.5
Isabella				3.26	15.0
Jamestown	65	23	43.6	7.82	2.5
Jolon				7.90	
Kennedy Gold Mine				6.25	13.0
Kentfield				12.31	
Kernville				2.72	16.0
King City	70	22	46.8	8.43	
Laporte	55	7	31.0	17.25	50.8
Laytonville				12.50	20.8
Legrande	70	30	46.0	4.40	
Lemoncove	69	28	48.2	5.04	
Lick Observatory	53	20	34.2	9.74	62.5
Livermore	66	27	46.6[e]	3.22	3.0
Lodi	64	28	45.7	3.94	T.
Lone Pine	51[e]	11	32.8[f]	2.21	19.5
Los Gatos	62	32	45.4	8.36	T.
Lowe Observatory				12.83	
Magalia				23.57	59.2
Mammoth	88	31	58.5	0.00	
Marysville	68	30	47.1	4.52	T.
Mena	75	26	50.9	0.33	
Merced	68	23	43.4	4.22	
Mercury				17.67	5.5
Mills College				5.46	T.
Milo				5.98	10.0
Milton (near)	61	28	46.6	4.76	0.4
Mohave	67	25	43.6	3.07	2.0
Mokelumne Hill	63	26	43.0	7.61	11.0
Mono Ranch	56	20	37.4	20.48	36.0
Montague	55	15	33.5	1.22	0.5
Monterio	60	24	40.3	6.50	
Monumental	50	13	33.6	22.55	43.5
Mountainview				4.80	
Mount St. Helena				19.95	45.0
Napa	63	29	45.0	6.50	2.5
Needles	76	23	50.7	0.21	
Nevada City	67	12	37.4	10.21	30.0
Newcastle	63	29	44.5	7.09	1.0
California—Cont'd.					
Newman	64	30	45.9	3.35	
Niles	64	30	46.6	4.74	T.
Nimshew	52	22	38.0	17.64	59.1
North Bloomfield	66	10	36.0	10.25	47.0
Oakland	62	34	48.2	4.26	T.
Ojai Valley	78	27	49.5	17.59	
Orleans	69	29	45.4	9.91	
Oroville (near)	63	28	45.0	6.71	2.0
Ozena				11.59	
Palermo	65	26	44.2	5.36	3.5
Pilot Creek				14.40	66.0
Pine Crest	74	35	49.6	15.11	0.2
Placerville	62	18	41.2	8.13	13.5
Point Lobos	62	42	52.6	3.19	
Porterville	69	29	48.6	3.87	
Poway	66	26	50.2	4.67	
Priest Valley				11.80	4.0
Quincy	40	4	28.9	11.89	61.5
Redding	61	27	42.0	8.57	17.2
Redlands	74	27	48.2	5.90	
Reedley	65	29	46.6	4.74	
Represa				6.31	T.
Rialto	80	27	48.6	13.61	1.0
Riovista	64	30	45.0	4.08	T.
Riverside	78	24	48.6	4.02	
Rocklin	65	27	46.4	5.51	
Rohnerville	65	29	45.2	6.75	2.0
Sacramento	63	30	45.5	5.48	0.5
Salinas	66	31	48.4	6.60	
Salton	62	54	57.9	1.00	
San Bernardino	77	24	49.0	6.33	
San Jacinto	81	25	49.2	5.11	
San Leandro	72	28	49.4	5.75	
San Miguel Island	64	38	49.9	8.51	
Santa Barbara	75	34	51.0	12.46	
Santa Clara College	65	28	47.5	5.01	
Santa Cruz	76	29	49.0	8.22	T.
Santa Maria	65	32	49.2	7.78	
Santa Monica	69	34	49.7	7.71	
Santa Rosa	64	26	45.0	7.57	3.0
Sausalito				3.98	T.
Shasta	71	24	42.0	13.65	19.1
Sierra Madre	70	31	49.0	12.98	
Sisson	48	5	31.0	9.48	61.0
Sonoma	63	28	45.8	6.91	1.0
Sonora	66	22	42.4	7.36	
Sterling	53	12	33.2	24.63	93.0
Stockton	64	31	45.0	3.94	T.
Storey	65	27	44.0	2.70	
Summerdale	61	10	31.7	14.95	99.0
Summit	54	−7	25.3	13.50	136.0
Susanville	48	0	27.6	4.19	42.0
Tamarack	45	−14	13.2	13.90	139.0
Towle	75	10	37.1	9.45	48.0
Truckee	50	−9	27.2	8.85	58.0
Tulare	70	26	46.1	4.06	
Tustin (near)				6.67	
Ukiah	63	23	42.0	8.06	12.5
Upland	66[e]	28[e]	43.8[e]	9.71	
Upperlake	67	19	41.3	5.30	7.0
Upper Mattole				21.95	7.2
Vacaville	64	28	45.8	6.54	2.2
Visalia	80	20	48.1	3.67	
Wasioja				13.00	
Westpoint				9.38	
West Saticoy				11.01	
Wheatland	61	28	44.1	4.67	1.0
Willows	63	26	43.4	4.84	8.6
Woodleaf				18.75	
Woodside	62	30	44.8	8.15	T.
Yosemite	50	3	29.8	11.96	97.5
Yreka				4.48	
Zenia	68	19	38.2	12.81	2.0
Colorado.					
Alford	63	1	29.5	0.05	1.8
Antelope Springs	43	−34	12.2	2.60	27.6
Arriba	61		30.8	T.	T.
Ashcroft	45	−16	20.9	2.00	29.5
Boulder	67	7	34.2	0.22	6.2
Breckenridge	44	−3	20.9	1.71	22.0
Buena Vista	52	−1	27.9	0.17	4.0
Burlington	65	3	30.0	0.18	2.2
Calhan	58	2	32.2	0.52	7.0
Canyon	66	11	38.7	0.08	1.5
Cascade				7.53	81.0
Castlerock	64	−4	28.9	0.10	1.5
Cheesman	64	6	34.4	T.	T.
Cheyenne Wells	65	0	30.2	T.	T.
Clearview	53	0	28.5	0.38	7.0
Collbran	50	−2	29.0	1.33	10.0
Colorado Springs	60	2	32.4	0.27	2.7
Cope	66	−1	31.4	0.14	1.1
Corona	34	−12	14.0	5.60	57.5
Cripplecreek				0.21	4.9
Dunkley	45[e]	2[e]	23.3[e]	1.25	21.4
Eagle	50	−3	26.2	1.25	14.8
Fort Collins	63	−5	26.0	0.23	4.2
Fort Morgan	59[d]	−10	24.9[e]	0.14	2.0
Colorado—Cont'd.					
Fowler				0.04	0.5
Frances	50	1	26.2	1.47	19.5
Fruita	51	6	32.8	0.63	2.7
Garnett	48	13[h]	25.0[d]	0.17	3.5
Gladstone				4.37	60.1
Gleneyre	61	0	32.8	0.18	2.1
Glenwood	47	3	28.6	1.42	20.0
Gothic	43	−10	19.9	5.30	65.2
Grand Valley	53	1	32.4	1.31	12.0
Grover				0.10	2.0
Gunnison	42[e]	−17	18.0[e]	0.62	8.6
Hahns Peak	51	−3	18.2	2.85	43.0
Hamps	63	−1	29.8	0.15	4.0
Hoehne	70	−2	32.4	0.20	1.5
Holly	72	7	35.9	T.	T.
Holyoke (near)	65	−1	24.8	0.36	0.5
Idaho Springs	57	2	30.4	0.09	1.0
Lake City	49	−12	21.7	1.44	21.0
Lake Moraine	47	2	25.0	0.56	9.0
Lamar	76	7	35.2	0.10	1.0
Laporte				0.26	4.0
Las Animas	70	6	33.3		
Lay	45	−15	22.6	1.66	19.5
Leroy	57	1	26.7	0.12	1.0
Longs Peak	51	−12	25.4	0.53	9.0
Lujane	50	−2	30.9	1.26	5.0
Manassas	51	−12	26.6	0.10	2.0
Mancos	54	−12	30.2	1.97	17.4
Meeker	50	−8	29.2	1.21	12.6
Moraine	52	−2	26.6	0.12	2.0
Pagosa Springs	50	−27	23.0	1.20	12.0
Paonia	54	4	32.6	1.21	7.5
Platte Canyon				0.15	3.0
Power House	55	0	30.2	2.45	17.2
Rangely	45	−9	23.8	0.32	5.1
Red Mountain				4.46	49.5
River Portal	46	−2	27.3	1.16	5.0
Rockyford	72	7	32.6	T.	T.
Saguache	51	−7	24.4	0.10	2.0
Salida	58	5	31.8	1.00	8.0
San Luis	50	−15	27.6	T.	T.
Santa Clara	56[e]	11[e]	33.6[e]	0.21	3.0
Sapinero	43	−2	21.2	1.70	19.8
Sheridan Lake	65	3	31.3	0.01	T.
Silt	52	7	30.8	1.01	13.0
Silverton	47	−15	20.0	4.79	70.0
Stonewall				0.03	1.0
Trinidad	68	7	38.6	0.05	
Victor	58	−2	32.1	0.21	3.3
Vilas				0.09	
Wagon Wheel	43	−31	14.0	2.38	31.0
Waterdale	62	0	29.1	0.16	1.9
Westcliffe	56	−5	30.8	0.15	3.0
Whitepine	39	−15	15.6	2.51	32.0
Wray	67	2	25.8	0.12	2.0
Yuma				0.28	2.3
Connecticut.					
Bridgeport	65	−3	28.9	3.91	10.2
Canton	58	−25	23.0	3.22	17.5
Colchester	64	−13	27.2	4.28	13.0
Falls Village				2.44	15.8
Hawleyville	63	−13	27.1	3.80	22.0
Lake Konomoc				5.43	
New London	65	−7	30.2	3.71	12.0
North Grosvenor Dale	60	−13	22.8	2.93	
Norwalk	64	−6	27.0	3.64	10.5
Southington	62	−11	26.4	3.95	15.0
South Manchester				2.57	15.0
Storrs	59	−13	25.4	3.13	
Voluntown	64	−13	27.6	4.05	14.0
Wallingford				3.23	13.5
Waterbury	62	−11	26.8	3.45	20.0
West Cornwall	57	−15	23.7	2.75	23.5
West Simsbury				2.93	18.5
Delaware.					
Delaware City				2.43	7.4
Dover	71	8	37.0	1.87	1.5
Milford	77	8	39.0	3.26	4.5
Millsboro	75	8	40.6	1.28	1.3
Newark	66	3	33.0	2.82	5.0
Seaford	71	8	37.8	2.53	2.0
District of Columbia.					
West Washington	76	10	35.6	2.91	6.6
Florida.					
Apalachicola	74	39	60.7	1.86	
Archer	84	36	63.0	1.18	
Avon Park	86	48	65.9	0.36	
Bonifay	79	30	59.4	1.32	
Brooksville	87	40	65.6	0.31	
Clermont	88	43	66.4	0.05	
De Funiak	79	31	59.8	1.79	
Deland	85	35	64.9		
Eustis	83	38	63.8	0.10	
Federal Point	82	43	63.2	0.47	
Fenholloway	80	33	60.3	0.81	
Fernandina	78	40	61.8	0.31	
Flamingo	83	54	71.0		
Fort Meade	84	40	62.9	0.08	

TABLE II.—*Climatological record of cooperative observers*—Continued.

Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
	°	°	°	Ins.	Ins.
***Florida*—Cont'd.**					
Fort Myers	81	49	66.0	1.30	
Fort Pierce	79	51	68.8	0.40	
Gainesville	81	38	62.6	0.81	
Grasmere	79	45	63.2	......	
Huntington	......	......	......	0.38	
Hypoluxo	81	50	70.2	1.39	
Inverness	84	42	62.6	0.45	
Jasper	80	33	60.8	0.73	
Johnstown	80	32	60.6	0.57	
Kissimmee	82	35	62.6	0.10	
Lake City	81	35	62.0	0.47	
Macclenny	80	30	59.9	0.36	
Malabar	......	......	......	0.65	
Manatee	85	45	65.1	0.36	
Marianna	81[j]	30[j]	56.4[j]	......	
Merritt Island	80	51	66.1	0.35	
Miami	82	51	70.2	1.48	
Middleburg	79	33	58.8	0.37	
Molino	81	25	58.2	2.87	
Monticello	76	33	60.4	1.72	
Mount Pleasant	80	31	62.7	0.12	
New Smyrna	87	42	65.2	0.00	
Ocala	84	40	64.4	0.88	
Orange City	88	37	62.9	T.	
Orlando	84	44	64.0	0.02	
Otter Creek	85	34	60.9	0.15	
Rockwell	81[d]	38[d]	62.0[d]	0.86	
St. Andrew	75	35	59.8	2.85	
St. Augustine	82	38	62.2	0.14	
St. Leo	88	42	64.6	0.34	
Switzerland	82	38	61.1	0.41	
Tallahassee	76	34	60.6	1.20	
Tarpon Springs	84	41	63.8	0.30	
Wausau	81	28	60.6	1.95	
Georgia.					
Abbeville	......	......	......	1.59	
Adairsville	74	20	50.8	0.62	
Albany	79	31	58.7	2.54	
Americus	79	28	54.6	2.30	
Athens	72	26	50.8	1.21	
Bainbridge	81	27	58.3	0.86	
Blakely	81	28	58.0	0.87	
Camak	79	22	54.0	1.47	
Canton	......	......	......	1.27	
Carlton	......	......	......	0.64	
Carrollton	77	20	51.3	1.90	
Clayton	75	21	48.3	0.96	T.
Columbus	78[g]	28[g]	55.8[g]	2.18	
Cordele	78	29	56.6	1.68	
Cuthbert	80	27	57.9	1.56	
Dahlonega	72	21	50.2	1.02	
Diamond	70	17	48.6	1.24	T.
Dublin	......	......	......	1.19	
Dudley	78	26	56.8	1.39	
Eastman	79	28	56.4	1.83	
Eatonton	79	25	54.3	3.06	
Elberton	75	23	52.7	0.74	
Experiment	76	25	54.1	0.77	
Fitzgerald	78	28	57.6	1.15	
Fleming	83	28	58.8	0.45	
Fort Gaines	83	27	57.2	1.48	
Gainesville	69	26	47.2	0.74	
Gillsville	74	25	49.7	0.94	
Glenville	76	30	56.8	0.69	
Greenbush	73	19	50.0	0.80	T.
Greensboro	78	23	52.8	2.10	
Griffin	77	24	53.7	1.39	
Hawkinsville	81	25	55.3	2.15	
Lisbon	80	18	51.4	1.02	
Lost Mountain	75	20	52.0	1.08	T.
Louisville	80	26	56.6	1.39	
Lumpkin	78	22	56.4	1.91	
Marshallville	80	25	56.4	1.75	
Mauzy	83	29	60.0	0.75	
Milledgeville	76	24	53.8	1.32	
Millen	81	22	55.2	1.10	
Montezuma	......	......	......	0.86	
Monticello	76	26	53.5	1.52	
Morgan	78	30	56.8	2.02	
Newnan	76	22	51.6	2.24	
Oakdale	......	......	......	1.34	
Point Peter	75	19	51.3	0.73	
Putnam	78	26	56.1	2.40	
Quitman	76	30	59.2	0.90	
Ramsey	76	19	53.1	1.24	
Resaca	......	......	......	0.80	
Rome	77	20	50.5	1.82	T.
St. George	78	30	61.6	0.34	
St. Marys	80	34	59.4	0.11	
Screven	82	28	58.4	0.15	
Statesboro	84	28	57.8	1.50	
Talbotton	78	24	55.0	2.16	
Tallapoosa	78	19	49.6	0.78	
Toccoa	76	23	49.6	0.86	
Valdosta	81	31	60.2	0.10	
Valona	84	30	59.0	0.47	
Washington	74	26	52.0	2.28	
Waycross	81	32	59.6	0.65	
***Georgia*—Cont'd.**					
Waynesboro	77	25	55.2	1.26	
Westpoint	79	24	52.6	1.94	
Woodbury	75	22	51.7	1.97	
Idaho.					
American Falls	46	−12	21.0	1.57	
Blackfoot	43	−15	20.5	1.37	18.0
Buhl	50	0	26.8	0.97	9.5
Caldwell	56	0	29.2	0.99	......
Cambridge	53	− 2	24.2	3.68	20.8
Chesterfield	49	−32	18.0	0.60	13.5
Dent	43	− 1	23.8	5.17	47.1
Dewey	48	− 9	22.7	3.30	33.0
Ellerslie	50	8	28.4	1.66	16.6
Emmett	55	1	29.3	1.34	5.0
Forney	56	−18	15.8	2.68	26.8
Garnet	58	11	32.4	0.98	......
Hot Springs	61	9	31.4	1.09	5.5
Idaho Falls	45	− 8	19.9	1.28	18.0
Kellogg	45	− 7	20.1	3.88	39.5
Lake	38	−14	11.4	4.60	46.0
Lakeview	43	− 5	19.8	5.30	43.0
Landore	44	− 3	20.2	8.28	89.1
Lardo	42	−16	16.8	5.28	55.2
Lost River	42	−18	11.2	2.05	22.0
Meadows	42	− 8	20.1	2.57	12.0
Milner	51	− 9	25.5	1.32	13.7
Moscow	41	− 3	20.0	5.77	41.5
Mountain Home	53	0	26.8	2.55	13.0
Murray	40	−12	16.8	4.88	75.0
Murtaugh	51[d]	− 4[d]	25.4[d]	1.57	16.0
Nevens Ranch	......	......	......	3.20	19.0
Oakley	46	3	26.2	1.54	15.0
Orofino	44	− 5	24.8	4.34	50.5
Paris	43	−12	19.2	3.50	40.4
Payette	54	− 1	28.9	0.96	7.5
Pollock	55	5	31.0	......	......
Poplars	......	......	......	1.13	10.1
Porthill	43	−20	14.3	2.18	39.5
Roosevelt	39	− 4	15.6	3.82	34.0
Rupert	48	−20	24.4	0.94	9.1
St. Maries	46	− 7	21.5	5.25	46.0
Salem	......	......	......	2.43	24.3
Salmon	45	−22	13.5	0.58	8.7
Standrod	......	......	......	1.65	29.7
Twin Falls	53	3	25.8	1.34	14.0
Vernon	38	− 8	17.8	3.55	35.5
Weston	48	−10	22.0[g]	2.59	31.5
Illinois.					
Albion	69	2	38.0	8.65	2.0
Aledo	51	− 6	25.4	4.10	12.0
Alexander	69	1	32.2	5.26	4.5
Antioch	49[d]	− 9[d]	22.6[d]	3.80	9.5
Ashton	51	− 7	24.0	4.13	12.0
Astoria	70	− 2	29.8	6.04	7.3
Aurora	55	− 5	25.6	3.69	8.6
Beardstown	......	......	......	4.76	2.0
Benton	65	4	40.3	7.05	3.0
Bloomington	67	− 2	30.6	5.18	9.9
Bushnell	69	4	29.0	3.83	3.7
Cambridge	54	− 6	26.8	3.69	11.0
Carlinville	69	3	34.3	5.57	3.0
Carlyle	......	......	......	6.51	......
Carrollton	71	2	33.8	5.32	2.1
Charleston	65	2	34.2	4.72	2.6
Chester	70[e]	7	40.0	5.56	1.2
Cisne	70	2	38.6	7.39	T.
Coatsburg	70	− 3	29.4	5.42	3.0
Cobden	66	5	39.8	5.82	0.5
Colchester	69	− 3	29.5	4.82	8.0
Decatur	67	0	30.2	7.47	2.0
Dixon	50	− 8	23.1	3.43	6.8
Dwight	62	− 3	28.6	5.38	11.9
Elgin	47	− 6	24.6	4.49	......
Equality	73	6	41.8	10.90	3.0
Flora	67[d]	4[d]	36.6[d]	7.59	0.2
Friendgrove	68	2	38.0	9.17	1.4
Galva	55	− 7	24.6	3.24	11.3
Grafton	......	......	......	5.52	1.5
Greenville	67	4	34.7	6.18	1.5
Griggsville	69	0	32.8	5.38	......
Halfway	69	4	39.5	8.26	2.5
Havana	67	0	31.5	6.79	5.5
Henry	58	− 5	28.0	5.85	11.0
Hillsboro	69	3	36.4	4.89	0.6
Hoopeston	63	− 2	30.9	5.89	12.7
Joliet	60	− 3	28.8	5.70	8.1
Kishwaukee	49	− 8	23.0	3.58	9.9
Lagrange	56	− 4	25.9	5.17	11.0
Laharpe	70	− 5	27.8	7.62	8.5
Lanark	50	−10	21.8	2.67	3.5
Lincoln	70	0	32.8	5.99	1.0
Loami	......	......	......	6.45	6.5
McLeansboro	69	4	39.2	7.72	1.9
Martinsville	65	2	33.8	7.57	0.2
Martinton	63[e]	− 3	29.6	4.57	6.5
Minonk	64	− 5	28.2	3.99	10.5
Monmouth	61	− 5	26.2	4.72	12.7
Morrison	48	− 8	23.8	3.98	10.2
***Illinois*—Cont'd.**					
Morrisonville	70	2	33.8	5.68	1.6
Mount Carmel	......	......	......	9.39	3.0
Mount Vernon	68	2	38.2	8.15	2.5
New Burnside	72	2	40.4	9.97	1.4
Olney	67	3	37.6	7.53	1.1
Ottawa	58	− 3	28.2	5.25	6.2
Palestine	67	1	36.6	6.55	1.5
Pana	65	2	34.1	6.18	1.2
Paris	63[e]	0	32.0	5.26	......
Philo	64	1	31.6	7.60	
Pontiac	65	− 3	30.0	5.62	14.0
Rantoul	65	− 1	32.0	5.69	9.2
Raum	71	2	41.2	8.90	2.5
Riley	47	− 7	23.1	3.67	13.8
Robinson	68	1	36.5	8.09	1.5
Rockford	49	− 5[e]	23.3[e]	3.18	......
Rushville	69	− 1	31.0	5.86	8.0
St. Charles	48	− 5	25.6	4.17	11.7
St. John	68	2	39.4	6.47	3.5
Streator	60	− 3	27.5	5.64	9.0
Sullivan	66	1	33.4	5.64	1.0
Sycamore	50	− 7	23.2	3.88	9.0
Tilden	77	3	38.6	6.13	2.5
Tiskilwa	55	− 7	26.1	4.47	8.0
Tuscola	64	1	32.0	5.87	4.0
Urbana	64	0	31.0	6.09	5.5
Vernon	67	5	36.0	6.82	......
Walnut	33	− 4	26.2	3.97	8.7
Warsaw	......	......	......	5.15	3.4
Windsor	65	3	33.8	4.99	1.8
Winnebago	49	− 8	22.4	3.68	13.0
Yorkville	55	− 5	25.8	3.68	6.1
Zion	47	−11	21.4	2.75	11.5
Indiana.					
Anderson	66	− 1	33.0	6.40	7.3
Angola	65	− 6	27.7	4.01	14.6
Auburn	62	− 7	26.2	4.35	......
Bedford	71	0	39.9	6.70	T.
Bloomington	68	1	38.8	9.74	4.0
Bluffton	57	− 5	28.1	6.21	6.0
Butlerville	70	− 2	37.2	11.83	3.5
Cambridge City	67	3	31.6	6.77	......
Columbus	73	− 3	36.2	7.88	2.0
Connersville	69	− 2	35.0	7.62	2.8
Crawfordsville	64	− 1[d]	33.2	......	......
Delphi	66	− 2	29.8	7.00	5.8
Elkhart	65	− 2	28.0	3.17	13.0
Eminence	68	1	34.8	7.16	2.0
Farmersburg	77[e]	1[e]	35.9[e]	......	3.0
Farmland	65	− 1	32.8	7.27	7.8
Fort Wayne	63	− 3	30.3	6.13	6.9
Franklin	69	− 1	36.0	5.85	2.5
Greenfield	66	0	34.8	7.91	2.0
Greensburg	69	− 3	36.4	8.38	3.0
Hammond	59	− 4	27.4	3.10	12.0
Huntington	64	− 3	30.6	5.57	12.9
Jeffersonville	75	4	41.5	11.33	6.3
Knox	63	− 2	29.8	4.17	9.4
Kokomo	67	− 3	32.8	5.59	6.5
Lafayette	66	− 1	30.2	7.14	6.3
Laporte	62	− 2	27.0	3.60	9.1
Lima	63	− 4	26.3	2.94	4.0
Logansport	65	− 1	30.2	4.60	4.0
Madison	71	1	39.8	8.45	3.2
Marengo	71	− 1	40.0	11.01	4.0
Marion	65	− 3	31.8	7.01	7.5
Markle	66	− 6	30.6	5.40	7.0
Mauzy	67	− 4	33.9	8.05	4.2
Moores Hill	69	− 4	36.4	8.71	2.2
Mount Vernon	66	3	39.8	9.26	3.0
Northfield	66	− 4	31.5	5.54	7.5
Paoli	71	− 2	38.2	10.19	2.5
Plymouth	63	− 3	29.1	3.13	5.5
Princeton	70	4	39.6	9.35	5.0
Rensselaer	65	− 3	30.8	4.83	8.7
Richmond	67	− 1	34.0	7.29	5.1
Rochester	60	− 2	30.6	4.80	8.4
Rockville	67	0	33.6	5.30	2.0
Rome	73	5	43.2	11.07	4.8
Salamonia	65	− 2	32.0	6.12	3.3
Salem	71	− 6	38.7	10.60	3.3
Scottsburg	71	2	40.5	9.85	3.1
Seymour	70	− 1	39.2	6.57	......
Shelbyville	67	− 2	34.5	......	1.5
South Bend	65	− 4	26.7	3.42	11.0
Syracuse	59	− 4	28.2	4.38	9.0
Terre Haute	68	4	36.4	7.15	1.8
Veedersburg	67	0	34.2	6.44	5.0
Vevay	70	− 1	42.2	9.30	3.5
Vincennes	70	4	36.2	8.21	1.0
Washington	69	2	37.2	8.62	1.2
Worthington	69	2[d]	35.0[e]	8.17	2.0
Indian Territory.					
Ardmore	78	18	48.1	2.46	
Calvin	......	......	......	5.09	T.
Chickasha	75	16	45.5	1.70	T.
Durant	80	18	47.8	1.28	
Fairland	75	12	43.0	2.79	T.

TABLE II.—*Climatological record of cooperative observers*—Continued.

Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
Indian Territory—Cont'd.	°	°	°	*Ins.*	*Ins.*
Fort Gibson	.....	.....	.....	3.47	0.7
Hartshorn[1]	76	17	48.0		
Healdton	78	16	48.0	3.90	T.
Holdenville	78	17	44.2	4.58	T.
Marlow	73	12	45.0	2.20	
Muskogee	74	12	44.6	2.82	1.0
Okmulgee	74	15	44.4	2.57	T.
Pauls Valley	77	15	47.2	3.80	
Ravia	76	19	49.4	1.64	
Tulsa	76	16	41.6	3.29	T.
Wagoner	75	10	43.8	2.93	0.5
Webbers Falls	79[d]	12	46.0	3.80	0.5
Iowa.					
Afton	45	− 6	20.8	1.25	5.0
Albia	50	− 8	21.4	2.19	9.5
Algona	39	−19	13.5	0.69	7.3
Allerton	50	− 4	24.4	2.79	9.9
Alta	40	−16	13.6	0.61	4.8
Alton	40	−16	14.8	0.35	3.5
Amana	46	− 6	21.7	2.68	7.4
Ames	47	−13	19.0	0.79	4.0
Atlantic	50	− 7	21.3	0.10	1.0
Audubon	44	−12	19.8	0.38	2.3
Baxter	48	−12	19.6	1.07	5.5
Bedford	49	− 8	22.6	1.46	5.7
Belleplaine	44	− 9	20.3	2.67	9.5
Bloomfield	51	− 1	25.1	3.56	9.7
Bonaparte	57	− 4	25.8	4.88	12.5
Britt	40	−20	13.9	0.75	6.3
Buckingham	.....	.....	.....	0.85	.....
Burlington	56	− 3	25.8	5.30	12.0
Carroll	45	−15	16.0	0.39	1.0
Cedar Rapids	49	− 7	19.4	2.57	5.6
Chariton	50	− 6	23.0	2.52	7.0
Clarinda	53	− 3	22.2	1.00	4.6
Clearlake	40	−20	14.6	0.81	6.2
Clinton	48	− 5	24.4	3.76	8.6
College Springs	51	− 5	24.0	0.84	4.1
Columbus Junction	47	− 5	25.2	3.45	15.5
Corning	45	− 5	21.9	1.57	4.3
Corydon	50	− 5	24.5	2.21	9.3
Creston	49	− 6	20.4	1.71	6.0
Cumberland	.....	.....		0.73	3.0
Decorah	14	−16	14.8	1.47	10.0
Delaware	44	−12	18.0	1.51	2.7
Denison	45	−13	18.8	0.12	1.2
Desoto	50	−10	20.7	0.52	2.5
Dows	43	−18	15.8	0.84	3.2
Earlham	48	− 9	20.2	1.49	6.5
Elkader	46	−17	18.3	1.67	6.5
Elliott	49	− 7	21.6	0.29	2.5
Estherville	40	−19	10.8	0.72	8.0
Fayette	43	−13	16.4	2.06	5.0
Forest City	40	−22	11.8	0.95	7.5
Fort Dodge	43	−15	15.6	0.70	3.5
Fort Madison	.....	.....	.....	4.02	9.5
Galva	42	−17	15.4	0.32	3.2
Gilman	.....	.....	.....	1.96	.....
Grand Meadow	44	−15	15.8	1.74	6.7
Grinnell (near)	47	−11	19.4	2.40	8.0
Grundy Center	44	−13	19.3	0.70	2.0
Guthrie Center	45	−13	20.2	0.48	2.3
Hampton	46	−16	15.0	1.63	5.5
Hancock	.....	− 8	21.4	0.18	2.0
Harlan	47	−11	19.6	0.60	1.8
Humboldt	42[e]	−18[e]	17.7[e]	0.16	4.0
Independence	.....	.....	.....	0.52	4.0
Indianola	48	− 6	21.4	2.01	6.2
Inwood	41	−22	11.6	0.79	6.5
Iowa City	49	− 8	20.8	2.12	8.5
Iowa Falls	40	−13	16.7	1.05	4.7
Keosauqua	54	− 2	24.8	4.62	10.0
Lacona	.....	.....	.....	2.66	7.0
Larrabee	41	−16	14.4	0.51	4.0
Leclaire	.....	.....	.....	3.34	13.2
Lemars	40	−17	14.3	0.20	2.5
Lenox	46	− 8	22.3	1.50	4.3
Leon	47	− 3	24.2	1.84	4.2
Little Sioux	45[d]	−12[d]	19.6[d]	0.21	1.0
Logan	44	−10	19.4	0.50	5.0
Maple Valley	.....	.....	.....	0.78	6.5
Marshalltown	44	−11	17.9	0.90	2.4
Mason City	40	−17	16.5	1.29	4.7
Massena	52	−10	20.5	0.56	3.5
Mountayr	52	− 4	23.4	1.96	9.0
Mount Pleasant	52	− 5	25.8	4.65	13.1
Mount Vernon	46	−10	20.1	2.63	10.7
Murray	48	− 5	22.1	1.26	
Muscatine	.....	.....	.....	3.77	9.2
Nevada	.....	.....	.....	0.88	4.5
New Hampton	35	−16	14.0	1.49	4.0
Northwood	39	−21	13.0	1.35	10.6
Odebolt	42	−13	17.4	0.34	3.2
Ogden	43	−13	19.0	0.63	3.0
Olin	45	− 7	27.7	4.62	11.8
Onawa	50	−10	19.3	0.38	2.0
Osage	36	−20	14.2	1.31	4.9
Oskaloosa	49	− 6	22.4	1.93	8.8
Iowa—Cont'd.	°	°	°	*Ins.*	*Ins.*
Ottumwa	51	− 4	24.2	3.10	10.8
Pacific Junction	52	− 5	21.6	0.52	3.7
Pella	57	− 6	23.1	2.46	7.8
Perry	44	−12	19.8	1.18	6.8
Plover	41	−18	14.0	0.50	5.0
Pocahontas	41	−16	15.6	0.55	5.4
Ridgeway	45	−18	14.5	2.78	9.8
Rock Rapids	40	−16	8.0	0.40	4.0
Rockwell	42	−15	17.8	0.30	3.0
St. Charles	56	− 6	22.6	1.87	4.5
Sheldon	41	−21	12.2	0.83	7.0
Sibley	39	−16	9.4	0.67	4.8
Sigourney	48	− 7	24.0	1.89	13.2
Sioux Center	38	−18	12.8	0.55	5.5
Stockport	54	− 4	25.8	3.80	11.5
Storm Lake	40	−21	13.6	0.89	9.0
Stuart	45	−11	20.2	0.58	.....
Thurman	57	− 5	22.6	0.78	3.7
Tipton	46	− 5	23.2	2.43	6.1
Toledo	44	− 9	19.8	1.17	4.8
Wapello	46	− 2	25.3	3.95	14.5
Washington	50	− 7	22.9	3.29	8.7
Washta	44	−20	15.6	0.53	3.2
Waterloo	43	−14	17.8	1.43	5.0
Waukee	43	− 9	20.2	1.77	8.2
Waverly	38	−15	17.1	1.43	6.1
Webster City	42	−16	18.7	0.76	4.0
Westbend	40	−17	14.2	0.62	4.3
Whitten	41	−15	17.7	1.65	2.0
Wilton Junction	45	− 7	24.1	2.75	0.5
Winterset	44	− 7	21.8	1.68	7.0
Woodburn	50	− 7	23.4	1.18	6.0
Zearing	48	−11	12.8	0.70	3.0
Kansas.					
Abilene	.....	.....	.....	1.40	1.2
Alton	51	− 4	25.0	1.17	2.5
Anthony	.....	.....	.....	1.44	1.0
Atchison	56	4	29.0	3.24	T.
Baker	57	− 2	27.5	1.59	3.0
Beloit	.....	.....	.....	1.05	2.5
Blue Rapids	.....	.....	.....	1.01	1.2
Burlington	73	3	35.0	4.78	2.0
Chapman	57	6	29.9	1.95	T.
Cimarron	65	6	31.8	0.30	T.
Clay Center	53	4	27.2	1.60	T.
Colby	64	1	26.2	0.13	0.7
Coldwater	68	10	34.5	1.04	T.
Columbus	72	10	39.3	3.73	0.1
Coolidge	70	5	30.8	0.05	0.5
Cottonwood Falls	66	2	31.4	3.06	4.7
Cunningham	64	9	33.0	1.85	T.
Dresden	61	1	26.8	0.16	1.0
Eldorado	70	1	35.0	3.62	1.0
Ellinwood	52	6	29.4	1.15	2.4
Ellsworth	53	− 7	27.2	1.07	1.4
Emporia	69	6	31.8	2.99	3.0
Englewood	68	13	36.7	1.01	T.
Enterprise	56	3	29.6	1.47	T.
Eskridge	64	6	29.3	3.06	1.0
Eureka	.....	.....	.....	4.21	1.8
Fall River	73	3	37.0	6.43	2.0
Farnsworth	62	− 2	28.6	0.31	1.0
Fort Scott	72	5	36.8	5.29	0.7
Frankfort	57	3	27.4	1.04	1.5
Fredonia	72[e]	4[e]	36.8[e]	5.60	1.0
Garden City	66	7	31.6	0.15	1.5
Garnett	69	7	33.7	6.74	2.5
Gove[e,1]	59	5	26.6	0.57	1.0
Greensburg	63	8	32.1		T.
Grenola	71	6	35.4	5.69	1.0
Hanover	52	2	25.6	0.77	1.0
Harrison	55	− 1	23.4	0.72	1.2
Hays	56	− 1	27.4	0.64	0.8
Horton	57	1	26.6	1.83	2.0
Hugoton	75	9	35.4	0.75	T.
Hutchinson	65	8	32.3	1.57	0.8
Independence	75	12	38.8	3.78	T.
Jetmore	65	3	32.2	0.49	1.0
Jewell	65	1	25.6	1.18	3.0
La Crosse	55	4	28.2	0.70	0.5
Lakin	65	7	31.0	0.01	1.0
Larned	56	1	28.4	0.72	T.
Lebanon	.....	.....	.....	0.76	3.0
Lebo	72	3	32.1	4.14	2.0
Lindsborg	.....	.....	.....	0.13	1.0
McPherson	59	7	30.0	2.23	T.
Macksville	67	6	31.3	1.10	0.5
Madison	73	− 5	32.1	4.59	1.2
Manhattan[c]	53	5	29.4	1.59	0.6
Minneapolis	50	4	27.8	0.94	3.0
Moran	72	4	36.3	5.71	1.0
Neosho Rapids	.....	.....	.....	3.10	1.5
Ness City	58	1	29.4	0.77	3.5
Newton	66	2	31.1	1.60	0.2
Norton	59	1	24.4	0.22	1.5
Norwich	68	10	34.1	3.07	1.2
Oberlin	.....	.....	.....	0.30	1.0
Olathe	72	6	32.2	4.71	4.0
Kansas—Cont'd.	°	°	°	*Ins.*	*Ins.*
Osage City	69[d]	5[b]	31.8[f]	2.87	2.5
Oswego	72	10	39.3	3.37	T.
Ottawa	73	5	32.2	2.95	4.5
Paola	71	5	33.2	5.26	3.0
Phillipsburg	56	1	25.4	0.36	1.0
Pleasanton	69	9	35.4	6.64	1.5
Pratt	63	8	32.2	1.38	0.5
Republic	52	0	24.8	0.75	1.0
Rome	72	10	36.6	4.67	T.
Russell	53	3	27.3	1.05	0.6
Salina	55	6	28.7	1.61	T.
Scott	64	2	30.6	0.21	0.5
Toronto	75	0	36.0	7.05	1.0
Ulysses	.....	.....	.....	0.50	.....
Valley Falls	60	3	29.2	4.09	2.0
Wakeeney	60	1	27.2	0.34	3.0
Wakeeney (near)	.....	.....	.....	0.40	3.0
Wallace	70	1	29.0	0.19	2.8
Walnut	71	3	37.0	6.34	T.
Winfield	70	10	36.8	4.67	T.
Yates Center	73	− 1	36.2	7.16	1.0
Kentucky.					
Alpha	72	13	49.8	3.00	3.0
Anchorage	72	− 7	40.6	10.60	6.0
Bardstown	73	− 3	42.4	9.40	7.0
Beattyville	74	5	43.2	6.40	1.0
Beaver Dam	73	− 3	41.6	8.83	6.5
Berea	71	− 4	44.7	7.48	3.2
Blandville	70	4	43.0	11.13	5.5
Bowling Green	75	1	45.8	5.77	8.2
Burnside	74	6	46.8	3.46	0.5
Cadiz	74	3	46.2	7.90	4.5
Calhoun	73	3	44.2	10.79	6.0
Catlettsburg	70[e]	3[e]	40.2[e]	6.78	1.0
Earlington	73	3	41.4	9.83	4.0
Edmonton	72	− 2	44.9	5.90	4.2
Eubanks	70	3	42.6	4.62	1.5
Falmouth	.....	.....	.....	7.75	5.0
Farmers	73	− 5	42.3	9.20	4.0
Frankfort	71	− 1	42.6	10.37	5.8
Franklin	75	2	46.3	3.52	5.0
Greensburg	82	− 6	43.0	5.68	6.8
High Bridge	.....	.....	.....	7.50	5.0
Hopkinsville	75	1	45.0	5.70	8.0
Irvington	72	1	43.0	10.37	6.0
Jackson	72	12	46.4	5.44	0.5
Leitchfield	72	− 3	42.6	9.02	8.0
Loretto	83	−10	45.7	10.64	7.0
Lynnville	76	5	46.6	7.76	6.0
Manchester	74	1	44.6	3.36	1.0
Marion	70	3	43.6	12.48	3.0
Maysville	73	− 4	39.0	7.35	8.0
Middlesboro	74	− 6	47.4	2.83	4.0
Mount Sterling	69	− 3	41.4	10.65	8.0
Owensboro	73	7	41.2	12.73	3.0
Owenton	68	− 1	39.7	10.25	6.5
Paducah	72	8	44.8	10.87	4.0
Princeton	73	2[e]	46.1[e]	9.98	4.1
Richmond	73	− 2	43.2	5.66	4.0
St. John	71	− 2	40.3	10.34	10.0
Scott	76	− 1	38.1	9.45	2.5
Shelby City	70	− 6	42.0	6.93	8.0
Shelbyville	72	− 8	39.6	9.84	6.0
Taylorsville	71	− 7	41.8	11.31	6.0
Williamsburg	75	−11	46.2	1.62	1.1
Williamstown	69	− 3	38.2	7.39	6.2
Louisiana.					
Abbeville	80	31	63.1	1.70	
Alexandria	84	29	60.3	0.91	
Amite	81	28	60.3	1.88	
Baton Rouge	84	31	62.8	2.11	
Burnside	81	31	62.7	1.49	
Calhoun	.....	.....	.....	2.50	
Cameron	76	31	61.2	0.64	
Cheneyville	82	31	61.8	2.15	
Clinton	81	30	61.0	2.80	
Covington	83	30	60.6	1.71	
Crowley	80[d]	34[d]	61.4[d]	1.03	
Donaldsonville	85	34	64.0	1.47	
Farmerville	85	25[e]	59.0[e]	2.12	
Franklin	83	31	63.2	1.74	
Grand Coteau	82	33	63.0	2.25	
Houma	80	31	61.2	1.66	
Jennings	81	34	62.4	1.28	
Lafayette	89	30	62.2	1.20	
Lake Charles	.....	.....	.....	1.20	
Lakeside	82	34	62.9	0.58	
Lawrence	82	38	60.9	2.73	
Libertyhill	84	25	58.1	1.63	T.
Logansport	.....	.....	.....	2.06	
Melville	81	29	59.0	0.80	
Minden	81	25	56.0	1.75	
Monroe	81	28	60.6	1.56	
Morgan City	.....	.....	.....	2.50	
New Iberia	81	37	64.2	1.50	
Opelousas	83	23	58.8	1.95	
Plain Dealing	80	20	55.5	4.03	T.
Rayne	81	33	63.0	0.93	

TABLE II.—*Climatological record of cooperative observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
	°	°	°	*Ins.*	*Ins.*
Louisiana—Cont'd.					
Robeline	82	25	57.0	0.55	
St. Francisville	84	33	60.1	1.50	
Schriever	87	29	62.4	4.16	
Simmesport	.....	.....	.....	0.94	
Southern University	.....	.....	.....	2.62	
Sugar Experiment Station	80	37	62.7	2.29	
Sugartown	80	31	60.3	4.45	
Maine.					
Bar Harbor	50	−19	19.2	3.00	22.0
Cornish	48	−21	16.5	3.04	16.0
Danforth	.....	.....	.....	2.77	12.5
Debsconeag	48	−25	13.8	2.85	28.5
Fairfield	45	−34	12.0	3.19	23.0
Farmington	45	−30	11.5	2.34	16.0
Gardiner	52	−41	15.8	3.12	25.5
Houlton	45	−28	6.6	1.90	19.0
Lewiston	47	−24	14.8	2.45	15.8
Madison	44	−36	10.4	2.38	21.5
Millinocket	45	−32	8.6	3.24	21.0
North Bridgton	48	−25	15.6	1.90	20.5
Orono	47	−4	13.0	4.01	31.5
Patten	42	−33	8.2	1.00	10.0
Rumford Falls	46	−33	12.3	1.67	20.1
The Forks	.....	.....	.....	1.78	21.0
Van Buren	43	−36	2.4	2.80	28.0
Winslow	47	−36	11.8	2.60	17.0
Maryland.					
Annapolis	66	11	36.2	3.75	5.0
Bachmans Valley	68	−3	33.2	4.28	7.5
Cambridge	76	9	38.4	1.94	2.2
Cheltenham	74	9	36.2	2.38	3.0
Chestertown	66	8	35.4	2.71	4.8
Chewsville	69	−6	32.6	3.33	8.0
Clearspring	73	4	32.3	3.39	10.5
Coleman	71	8	36.0	3.19	8.0
Collegepark	76	5	35.8	2.19	2.8
Cumberland	69	−1	32.4	3.98	15.7
Darlington	71	4	32.9	2.92	6.5
Deerpark	60	−17	31.4	7.00	8.0
Denton	73	3	37.0	2.04	2.5
Easton	70	8	37.8	1.93	2.2
Fallston	71	5	33.4	3.20	6.1
Frederick	73	4	34.0	3.26	5.9
Frostburg	.....	.....	.....	5.85	13.2
Grantsville	64	−10	32.0	6.56	16.0
Great Falls	76	6	36.0	1.95	3.3
Greenspring Furnace	71	0	32.6	4.09	6.6
Harney	.....	.....	.....	3.55	6.7
Jewell	74	10	37.0	2.27	1.2
Johns Hopkins Hospital	.....	.....	.....	2.53	6.7
Keedysville	73	−2	34.2	2.90	8.0
Lake Montebello	72	6	34.2	3.15	6.2
Laurel	75	5	34.8	3.28	5.0
Monrovia	71	5	34.3	3.06	5.4
Mount St. Marys College	70	7	34.2	3.80	14.6
Oakland	67	−19	34.8	6.55	9.0
Ocean City	66	13	42.4	.....	.....
Pocomoke City	69	10	41.0	2.25	1.8
Porto Bello	71	12	40.6	1.34	0.5
Princess Anne	71	8	39.2	1.98	1.8
Salisbury	73	8	39.6	1.47	2.5
Solomons	73	13	37.6	1.84	2.5
Sudlersville	71	6	35.5	2.33	4.5
Takoma Park	75	7	34.4	2.80	3.8
Taneytown	70[d]	5[d]	34.0[d]	2.96	8.1
Van Bibber	69	7	34.8	3.27	.....
Westernport	69	1	34.6	4.46	10.3
Woodstock	71	8	36.4	2.62	7.1
Massachusetts.					
Amherst	54	−24	22.2	2.73	16.5
Bedford	54	−10	23.6	2.88	17.0
Bluehill (summit)	56	−12	24.2	3.76	21.5
Chestnuthill	57	−9	26.0	3.80	17.0
Concord	56	−12	22.2	3.03	15.5
Fallriver	59	−9	27.[illegible]	3.13	16.0
Fitchburg	54	−10	22.9	2.69	20.0
Framingham	54	−17	23.2	3.22	15.3
Groton	53	−12	20.8	2.37	17.0
Hyannis	.....	.....	.....	4.07	8.5
Jefferson	.....	.....	.....	2.95	17.8
Lawrence	55	−12	22.6	2.37	17.0
Leominster	.....	.....	.....	2.50	17.1
Lowell	52	−10	24.2	2.77	.....
Middleboro	61	−12	27.2	3.09	18.3
Monson	58	−22	23.6	2.80	17.5
Plymouth	56	−8	28.6	4.11	T.
Princeton	.....	.....	.....	2.64	18.8
Provincetown	60	7	32.5	4.20	9.0
Salem	.....	.....	.....	2.76	18.0
Somerset	62	−18	26.8	4.23	18.5
Sterling	.....	.....	.....	2.61	14.2
Taunton	60	−16	26.0	3.37	.....
Webster	.....	.....	.....	4.80	17.6
Westboro	55	−14	24.8	3.41	16.5
Weston	56	−11	23.2	2.88	17.6
Williamstown	52	−15	22.5	2.24	10.3
Winchendon	.....	.....	.....	2.50	17.0
Worcester	56	−10	24.2	2.69	20.8

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
	°	°	°	*Ins.*	*Ins.*
Michigan.					
Adrian	62	−9	25.6	3.65	9.0
Agricultural College	51	−11	23.2	3.97	11.0
Alma	53	−13	20.7	4.61	19.0
Ann Arbor	61	−8	24.4	4.68	16.1
Arbela	62	−10	23.2	5.11	8.0
Ball Mountain	60	−10	23.1	4.95	10.5
Baraga	42	−26	13.4	1.00	10.0
Battlecreek	61	0	25.2	2.95	7.5
Bay City	57	−7	21.5	2.75	13.0
Benzonia	48	−2	22.5	.....	.....
Berlin	58	−11	22.2	3.79	7.6
Big Rapids	51	−12	20.4	3.91	11.0
Birchwood	65	−8	29.1	2.54	13.5
Blaney	38	−14	13.8	2.87	21.2
Bloomingdale	63	0	26.0	4.05	11.0
Calumet	31	−16	11.2	3.19	38.8
Cassopolis	61	−4	26.2	4.40	11.0
Charlevoix	46	−9	18.7	2.23	11.8
Charlotte	55	−10	23.6	3.98	12.5
Chatham	35	−20	12.5	3.73	33.8
Cheboygan	52	−10	18.8	2.13	11.0
Clinton	61	−10	25.0	3.38	3.8
Coldwater	65	−5	27.8	3.76	9.4
Concord	60	−7	24.7	3.88	16.5
Deer Park	37	−17	15.6	4.37	42.5
Dundee	69	−11	26.8	4.58	14.7
Eagle Harbor	34[e]	−11[e]	13.6[e]	3.89	.....
East Tawas	51[e]	−10[e]	19.6[e]	2.74	6.0
Eloise	63	−16	24.4	3.73	11.9
Flint	59	−13	21.8	3.87	8.5
Frankfort	45	5	22.2	3.05	20.0
Grape	67	−6	27.8	3.24	12.0
Grasslake	61	−10	24.4	4.42	11.0
Grayling	47	−20	17.5	3.50	25.0
Hagar	60	−5	24.8	6.15	7.2
Harbor Beach	46	−8	23.6	.....	.....
Harrison	48	−16	18.9	2.05	8.0
Harrisville	47	−8	20.6	4.47	23.7
Hayes	45	−7	21.6	2.38	8.0
Highland	.....	.....	.....	4.33	12.5
Hillsdale	61	−6	24.7	3.78	10.3
Holland	54	−6	24.2	4.91	21.0
Howell	60[e]	−15[e]	21.6[e]	3.93	2.6
Humboldt	32	−42	7.0	0.65	6.0
Iron Mountain	36	−25	11.2	1.09	14.0
Iron River	36	−34	8.3	2.50	11.0
Ironwood	32	−23	6.6	2.60	26.0
Ivan	48	−18	17.8	1.70	14.0
Jackson	62	−3	26.0	3.16	10.5
Jeddo	59	−6	23.0	3.52	9.6
Kalamazoo	60	−1	25.5	3.05	13.0
Lansing	59	−6	23.9	3.69	11.1
Ludington	48[d]	3[d]	23.0[d]	3.10	12.0
Mackinac Island	40	−15	15.6	4.70	35.1
Mackinaw	43	−10	18.4	2.70	17.0
Mancelona	45	−10	18.4	.....	11.0
Manistee	45[e]	1[e]	24.4[e]	.....	.....
Maple Ridge	35	−20	11.5	2.60	26.0
Marlboro	50[d]	−10[d]	19.9[d]	2.45	7.5
Menominee	42	−12	16.2	2.81	19.5
Montague	45	2	22.3	3.10	6.5
Mount Clemens	60	−9	23.8	2.73	8.2
Mount Pleasant	50	−11	20.8	2.63	7.8
Muskegon	45	2	22.7	3.03	6.0
Newberry	40	−29	9.9	1.90	19.0
Old Mission	48	−1	20.6	1.56	8.8
Olivet	57	−6	23.5	4.49	10.4
Omer	52	−14	19.5	0.90	9.0
Owosso	60	−22	21.5	4.20	8.2
Petoskey	49	−10	20.4	2.19	16.4
Plymouth	58	−11	25.1	4.37	8.7
Pontiac	62	−14	24.0	.....	.....
Port Austin	47[d]	−10[d]	21.7[d]	0.87	5.0
Powers	36	−20	12.1	3.00	30.0
Reed City	50	−18	19.8	5.20	13.0
Saginaw (W. S.)	59	−5	23.4	3.39	10.4
St. Johns	58[e]	−1[e]	22.4[e]	4.38	11.0
St. Joseph	62	5	27.8	5.50	26.0
Saranac	57	−12	22.5	2.37	10.0
Slocum	48	−6	22.2	4.37	7.0
South Haven	60	−5	25.4	3.76	14.2
Stanton	58	−10	21.0	5.93	23.2
Thomaston	34	−33	8.9	3.10	31.0
Thornville	67	−10	26.7	6.41	14.5
Traverse City	52[e]	0[e]	21.1[e]	3.66	32.0
Vassar	48	−10	23.8	6.90	14.0
Wasepi	62	−3	26.0	3.56	8.5
Webberville	60	−20	23.0	4.95	6.9
West Branch	37	−25	11.6	2.90	29.0
Whitefish Point	35	−15	15.0	4.85	39.5
Woodlawn	44	−25	15.7	3.15	16.5
Ypsilanti	65	−14	24.4	3.87	11.4
Minnesota.					
Albert Lea	36	−23	9.9	0.92	10.0
Alexandria	34	−29	1.0	0.93	7.5
Angus	32	−39	−7.4	.....	.....
Bagley	34	−45	−5.4	0.90	9.0
Beardsley	40	−26	2.0	1.62	11.5

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
	°	°	°	*Ins.*	*Ins.*
Minnesota—Cont'd.					
Beaulieu	36	−35	−2.8	0.30	8.0
Bird Island	36	−26	5.3	0.71	6.4
Caledonia	36	−15	13.7	1.56	9.5
Collegeville	36	−19	6.9	2.45	26.0
Crookston	33	−32	−5.1	1.80	18.0
Detroit	35	−40	−6.0	0.65	8.0
Fairmount	38	−20	10.8	0.85	7.1
Faribault	34	−27	7.9	0.74	10.0
Farmington	39	−25	7.4	1.47	14.5
Fergus Falls	36	−25	1.8	1.06	10.6
Fort Ripley	.....	.....	.....	0.70	29.0
Glencoe	38	−22	7.4	1.36	13.0
Grand Meadow	40	−21	10.6	1.73	14.5
Hallock	31	−42	−11.4	2.35	23.5
Hinckley	34	−31	4.0	.....	.....
Leech Lake	32	−39	−2.5	1.40	21.1
Little Falls	33	−24	0.8	0.40	4.0
Long Prairie	35	−31	0.3	0.72	9.5
Luverne	38	−15	10.6	0.38	10.0
Lynd	40	−22	6.4	0.99	13.5
Mankato	.....	.....	.....	0.96	11.8
Maple Plain	35	−27	5.4	1.54	13.5
Milaca	31	−32	1.8	.....	.....
Milan	36	−26	1.6	1.35	13.5
Minneapolis	35	−22	7.3	1.01	8.5
Montevideo	38	−24	4.4	1.06	13.5
Mora	34	−32	3.0	1.28	13.0
Morris	36	−26	1.7	1.25	14.0
Mount Iron	43	−37	1.0	2.70	27.0
New London	35	−26	1.5	0.94	12.0
New Richland	44	−24	11.3	1.75	16.0
New Ulm	37	−23	8.8	2.25	22.5
Park Rapids	35	−32	−2.6	2.28	22.8
Pine River	34	−39	−2.0	1.01	13.5
Pipestone	37	−17	7.8	0.14	1.4
Pokegama Falls	34	−38	−1.2	1.00	11.8
Redwood Falls	37	−22	8.0	1.20	12.0
Reeds	.....	.....	.....	0.88	20.0
St. Charles	44	−26	10.6	1.59	.....
St. Cloud	37	−26	4.0	.....	.....
St. Peter	.....	.....	.....	0.68	7.2
Sandy Lake Dam	35	−37	1.6	1.03	13.7
Shakopee	36	−25	8.6	1.15	11.5
Stephens Mine	35	−44	−0.4	1.00	10.0
Taylors Falls	40	−32	9.8	.....	.....
Tonka	.....	.....	.....	0.70	.....
Two Harbors	40	−29	6.8	1.50	25.5
Wabasha	42	−24	11.6	1.44	11.0
Wadena	35	−37	−2.8	0.80	14.8
Winnebago	33[h]	−21	9.0[d]	0.58	9.8
Winona	40	−18	10.7	1.00	7.7
Worthington	35	−19	7.2	.....	.....
Zumbrota	36	−23	10.6	1.12	.....
Mississippi.					
Aberdeen	80	19	53.6	1.44	T.
Agricultural College	80	19	54.5	2.85	T.
Austin	76	21	53.7	2.97	0.5
Batesville	80	20	53.6	1.61	T.
Bay St. Louis	79	33	60.8	2.12	
Bellefontaine	78	20	55.2	0.60	
Biloxi	79	34	62.0	1.86	
Booneville	74	18	51.6	2.19	
Brookhaven	80	25	56.2	1.51	
Canton	81	21	57.8	4.15	
Columbia	.....	.....	.....	2.10	
Columbus	81	20	53.2	0.99	
Corinth	74	18	49.0	4.46	0.5
Crystal Springs	79	23	56.7	0.92	
Duck Hill	80	19	53.9	3.36	
Edwards	82	23	58.4	1.64	T.
Enterprise	.....	.....	.....	2.60	
Fayette	81	25	58.4	0.15	
Fayette (near)	.....	.....	.....	0.34	
Greenville	80[h]	22	55.6[d]	2.03	T.
Greenwood	83	22	55.0	3.80	
Hattiesburg	82	28	58.2	2.04	
Hazlehurst	80	24	57.6	0.92	
Hernando	76	16	49.4	2.13	T.
Holly Bluff	.....	.....	.....	4.19	
Holly Springs	74	16	48.4	1.72	0.8
Indianola	78	21	53.6	6.52	T.
Jackson	80	23	56.9	1.92	
Kosciusko	80	20	55.4	2.75	
Lake	81	21	56.0	1.74	
Lake Como	80	28	58.5	2.00	
Laurel	82	25[i]	57.8[e]	1.74	
Leakesville	83	27	59.4	1.92	
Louisville	81	20	56.4	2.45	
McNeill	80	28[e]	62.6	1.16	
Macon	80	21	54.0	2.73	
Magee	79	22	57.2	1.52	
Magnolia	80	28	60.1	1.75	
Merrill	.....	.....	.....	3.40	
Natchez	81	26	58.7	0.88	
Okolona	78	20	51.4	1.77	T.
Pearlington	79	29	61.3	2.05	
Pecan	79	33[d]	62.3	3.06	
Pittsboro	76	19	52.2	.....	

TABLE II.—*Climatological record of cooperative observers*—Continued.

Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
Mississippi—Cont'd.	°	°	°	*Ins.*	*Ins.*
Pontotoc	76	20	52.0	1.92	T.
Porterville	80	21	55.4	2.79	T.
Port Gibson	81	26	56.8	1.22	
Quitman	80	24	57.5	2.10	
Ripley	78	17	50.3	5.95	1.0
Shoccoe	80	21	57.9	6.17	T.
Shubuta				2.01	
Suffolk	79	25	59.7	1.50	T.
Tchula	82	23	57.8	3.32	T.
Tupelo	79	20	50.3	1.78	
University	77	18	52.6	2.72	0.5
Utica	80	24	58.2	0.45	
Walnutgrove	79[d]	22[d]	57.3[d]	6.58	
Watervalley	80	19	53.0	3.50	T.
Waynesboro	79	25	55.7	2.50	
Woodville	78	27	59.6	1.70	
Yazoo City	81	24	57.1	3.76	
Missouri.					
Appleton City	72	7	34.6	7.08	0.5
Arthur	72	10	38.0	6.80	1.0
Avalon	71	1	30.7	5.85	
Belle	72	10	38.4	3.59	1.5
Bethany	49	2	37.2	2.57	5.0
Birchtree	73	6	42.2	3.53	1.3
Bolivar	72	6	39.5	3.70	
Boonville				6.04	0.9
Brunswick	72	3	30.8	5.23	2.2
Cape Girardeau				8.15	3.0
Caruthersville	79	12	47.8	9.06	3.0
Clinton	71	9	36.2	9.24	0.5
Conception	56	0	24.8	1.24	0.5
Darksville	72	1	33.3	5.53	2.5
Dean	75	1	42.8	4.03	0.5
Decaturville	70	2	36.2	4.86	0.2
De Soto	70	4	39.4	4.49	2.3
Doniphan	73	10	44.1	7.06	1.5
Eldorado Springs	73	[illegible]	39.0	4.45	1.0
Fairport				2.35	3.7
Farmington	69	−4	39.0	2.84	1.9
Fayette	71	6	33.6	4.88	0.9
Fulton	74[1]	14[1]	37.6[1]	6.19	0.8
Gano	68	3	40.1	4.24	3.1
Goodland	68	5	39.0	4.30	5.5
Gorin				4.16	2.8
Grant City	53	−2	25.1	1.83	4.0
Harrisonville	70	6	31.8	6.83	5.5
Hazlehurst				2.70	2.5
Hermann				5.54	0.5
Houston	70	7	41.0	4.29	4.4
Huntsville				5.60	
Ironton	72	4	40.0	5.74	2.5
Jackson	70	8	42.0	7.35	1.0
Jefferson City	77	3	33.8	4.51	6.5
Joplin	72	13	41.5	3.99	T.
Kidder	58	3	30.1	3.63	4.4
Koshkonong	75	5	43.9	5.57	1.0
Lamar	69	9	38.3	3.46	T.
Lamonte				3.67	T.
Lebanon	70	5	39.9	4.72	4.5
Lexington	72	5	32.1	4.99	1.0
Liberty	69	4	30.9	4.32	2.2
Lockwood	72	8	38.7	3.96	0.5
Louisiana	74	4	34.8	5.55	4.0
Macon	72	0	31.7	5.83	6.0
Marblehill	71	8	41.4	6.58	2.1
Marshall	72	4	32.4	5.61	4.2
Maryville	52	0	23.8	1.51	1.2
Mexico	73	2	31.4	6.03	3.0
Monroe	72	0	31.3	5.65	4.3
Mountain Grove	71	6	39.6	3.29	2.0
Mount Vernon	72	7	38.8	3.43	
Neosho	73	7	41.9	4.35	0.5
Nevada				5.02	2.5
New Madrid				9.13	
Oakfield	71	4	36.8	5.23	4.0
Oregon	51	0	25.6	2.66	4.0
Rolla				3.57	2.3
St. Charles	72	5	36.4	4.59	5.5
St. Joseph				1.71	1.5
Sarcoxie				2.38	T.
Sedalia	72	6	35.2	6.49	2.8
Seymour	72	5	39.8	3.33	
Sikeston	72	4	43.4	8.81	4.0
Steffenville	71	−1	30.9	5.90	
Sublett	68	−2	27.2	4.30	4.5
Trenton	52	2	28.2	3.93	2.5
Unionville	52	−5	23.8	5.75	6.5
Versailles	73	0	36.1	9.45	4.0
Warrensburg	72	6	34.8	8.99	3.5
Warrenton	72	2	33.0	5.86	3.5
Warsaw	75	6	37.1	6.57	4.0
Wheatland				5.02	2.0
Willowsprings	72	4	43.1	4.09	0.8
Windsor	72	5	35.3		
Montana.					
Absarokee				0.70	9.0
Anaconda	48	−25	12.8	0.99	
Augusta	49	−33	4.8	2.10	21.0
Montana—Cont'd.					
Babb	42	−39	2.4	1.49	16.2
Billings	55	−28	12.3	1.25	14.0
Bozeman	45	−25	11.4	0.98	13.0
Boulder	50	−28	8.4	1.00	12.6
Bowen	42	−48	3.0	2.42	26.2
Broadview	47	−32	7.0	0.52	6.7
Butte	47	−17	14.8	0.80	8.0
Canyon Ferry	55	−26	7.3	0.34	5.0
Cascade	52	−30	10.1	1.60	16.0
Chester	44	−40	−4.2		
Chinook	30	−45	−5.8	1.95	19.5
Choteau	51	−30	4.4		
Clear Creek	47	−31	1.6	2.30	24.0
Columbia Falls	49	−25	12.2	2.76	24.5
Copper				1.35	14.0
Crow Agency	47	−31	8.0	0.95	9.5
Culbertson	28	−42	−7.0	0.67	
Dayton	48	−15	14.6	1.23	12.9
Decker	48	−32	6.0	0.50	5.0
Dillon	46	−31	13.9	1.65	16.8
Ekalaka	43	−27	9.9		
Ericson				1.15	11.5
Evans	47	−30	11.6	4.30	43.0
Fallon	33	−43	−1.9	0.37	3.7
Forsyth	46	−37	2.4	1.70	17.0
Fort Benton	44	−38	−2.1	2.40	24.0
Fort Harrison	47	−25	7.2		
Fort Logan				1.05	12.5
Fortine	45	−35	7.9	1.87	26.0
Glasgow	31	−41	−9.2		
Glendive	38	−38	−0.7	0.65	10.6
Gold Butte				1.29	16.8
Graham	51	−26	12.9	0.22	5.0
Grayling				2.07	29.0
Greatfalls	54	−26	7.1	1.78	17.8
Hamilton	46	−18	14.0	1.51	30.0
Homepark				0.95	7.0
Huntley[d]	50	−3	12.6		
Lewistown	48	−25	9.4	1.88	18.8
Livingston	50	−26	16.3	1.17	17.5
Lodge Grass	51	−30	9.4	0.83	6.7
Malta[m]	35	−41	−10.2		
Marysville	46	−28	5.2	5.90	67.5
Missoula	46	−17	12.5	2.94	17.5
Norris[m]	46	−22	17.3	0.56	5.0
Nye				0.93	18.0
Ovando	40	−30	4.6	2.61	35.0
Philipsburg	50	−29	11.6	1.13	14.5
Plains	45	−12	15.0	1.80	26.0
Plentywood	25	−44		1.64	18.5
Polson	45	−12	16.4	0.73	
Poplar	28	−43	−9.2	1.30	13.0
Raymond				1.06	13.5
Redlodge	55	−30	13.4	0.49	8.7
Renovo	49	−30	12.8	0.50	6.7
Ridgelawn	34	−40	−5.2	1.31	14.0
Saltese				6.79	77.0
Springbrook	36	−35	0.1	1.96	19.6
Steele	52	−29	6.1	1.88	21.0
Tokna	28	−39	−2.4	1.64	16.5
Troy	45	−22	14.4	1.83	18.3
Twin Bridges[g]	46	−28	11.4		
Utica	51	−26	11.2	1.34	14.8
Wolf Creek	51	−29	6.6	0.87	8.7
Yale[e]	49	−29	10.0		
Nebraska.					
Agate	56	−24	18.2	0.60	5.0
Ainsworth	50	−15	14.2	0.56	6.2
Albion	48	−12	17.7	0.50	5.0
Alliance	54	−12	20.4	1.15	16.0
Alma	58	0	23.4	0.22	1.2
Anoka				1.15	10.0
Arapaho				0.30	3.0
Arcadia				0.30	3.0
Ashland	49	−7	21.7	0.50	3.2
Ashton				0.11	
Atkinson	45	−18	13.0	0.53	5.3
Auburn	55	−3	24.9	1.37	2.5
Aurora	54	−7	21.3	0.30	3.0
Beatrice	49	−2	24.8	0.46	2.0
Beaver	55	0	25.6	0.26	1.0
Bellevue	49	−7	22.0	0.58	4.7
Blair	46	−11	20.4	0.34	2.5
Bloomfield	47	−20	12.2	0.47	6.5
Bradshaw				0.65	0.5
Bridgeport	61	−8	23.2	0.45	4.5
Broken Bow	48	−2	18.3	0.78	0.3
Burchard				0.35	1.0
Burwell				0.45	4.5
Callaway	52	−5	20.4	0.45	5.0
Central City				0.12	1.2
Chester				0.40	4.0
Cody				0.75	7.5
Columbus	58	−9	18.2	0.20	1.0
Crawford				0.35	3.5
Crete	51	−4	22.4	0.47	1.2
Culbertson	40	0	22.9	0.28	
David City	51	−9	19.7	0.49	2.6
Nebraska—Cont'd.					
Dawson	56	−2	25.8	0.94	
Dubois				1.05	
Duff				0.50	5.0
Dunning				0.50	5.0
Edgar				0.66	1.5
Ellis				0.15	1.0
Ericson				0.35	3.5
Ewing				0.20	2.0
Fairbury	51	0	24.3	0.84	3.0
Fairmont	55	−10	19.9	0.67	2.8
Fort Robinson	57	−14	17.7	1.06	11.0
Franklin	56	−1	23.8	0.40	
Fremont	49	−10	20.1	0.32	3.0
Fullerton				0.48	4.2
Geneva	52	−4	21.8	0.18	1.8
Genoa (near)	43	−10	18.3	0.58	6.0
Gosper				0.30	3.0
Gothenburg	53	−4	21.2	0.50	3.0
Grand Island	55	0	23.0	0.42	T.
Grant	62	−3[g]	25.4[d]	0.44	
Greeley				0.10	1.0
Guide Rock				0.33	0.5
Haigler				0.10	1.0
Halsey	48	−11	15.6	0.30	
Hartington	41	−20	12.8	0.95	9.5
Harvard	52	−6	20.3	0.56	1.0
Hastings*[1]	44	−3	20.8	0.30	2.5
Hayes Center	59	−1	21.4	0.10	1.0
Hay Springs	54	−14	17.8	0.30	3.0
Hebron	51	0	22.8	0.58	1.3
Hendley				0.18	1.5
Hickman				1.10	1.0
Holbrook	54	−1	23.4	0.30	3.1
Holdrege	51	−3	23.1	0.30	3.0
Hooper*[1]	44	−6	19.6	0.19	2.3
Imperial	64	−4	23.6	0.69	6.5
Kennedy	55	−15	16.8	1.05	10.5
Kirkwood	48	−19	14.0	0.50	7.0
Leavitt	53	−8	19.5	0.10	1.0
Lexington	49	−4	19.4	0.58	4.0
Lodgepole[k]	50	−5	22.6		
Loup	45	−8	19.0	T.	T.
Lynch	46	−23	13.0	0.80	8.0
McCook				0.38	1.8
McCool				0.74	1.0
Madison	51	−12	17.6	0.40	4.0
Marquette	50	−4		0.34	3.2
Mason				0.53	
Merriman				0.30	3.0
Minden	51	−4	20.4	0.59	2.2
Monroe				0.34	3.5
Nebraska City	54	−3	24.4	0.60	3.0
Nemaha				0.40	2.2
Norfolk	52	−15	16.9	0.36	4.5
North Loup	49	−9	18.1	0.38	4.5
Oakdale	47	−13	14.2	0.37	4.2
Oakland	55	−14	18.7	0.11	
Odell				0.47	1.5
Ord				0.60	
Osceola	57	−8	20.3		
Palmer				0.40	4.0
Palmyra*[1]	52	−4	22.9	0.50	1.0
Pawnee City	54	−3	25.2	0.59	3.0
Plymouth	47	−2	23.6	0.47	2.2
Purdum	48	−13	16.0	0.60	6.0
Ravenna	49	−10	19.4	0.31	3.5
Redcloud	57		26.0[d]	0.68	1.0
Rulo				1.25	2.5
St. Libory				0.32	2.8
St. Paul	51	−8	20.7	0.41	4.0
Santee	47	−22	14.0	0.90	9.0
Schuyler				0.41	3.0
Scottsbluff	59	−20	20.6	0.80	4.0
Seward	48	−6	21.6	0.59	6.0
Stanton	50	−10	16.6	1.00	4.0
Strang				0.55	T.
Stratton				0.10	1.0
Superior	58	−1	24.2	0.68	2.0
Syracuse				0.45	2.5
Tablerock				1.00	3.5
Tecumseh	52	−4	25.4	0.60	
Tekamah	45	−11	18.8	0.60	4.0
Turlington	51	−4	21.9	0.75	5.5
University Farm	48	−5	22.2	0.47	2.0
Wahoo				0.87	1.7
Wakefield	50	−18	15.7	0.52	4.3
Watertown				0.80	8.0
Wauneta				0.24	
Weeping Water				1.42	2.0
Westpoint	55	−13	18.0	0.35	3.5
Wilber				0.45	1.0
Wilsonville				0.20	2.0
Winnebago	52	−18	16.2	0.85	3.5
Wisner				2.14	3.5
Wymore				0.21	2.1
York	54	−6	21.0	0.53	4.0
Nevada.					
Amos	52	0	25.4	1.10	8.3

TABLE II.—*Climatological record of cooperative observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
	°	°	°	*Ins.*	*Ins.*
***Nevada*—Cont'd.**					
Aura	46	− 8	23.7	6.70	67.0
Austin	55	5	27.4	1.74	18.5
Battle Mountain	65	8	28.2	......	......
Carlin*[1]	40	− 8	24.5	1.10	11.0
Carson Dam	58	5	30.8	0.06	T.
Clover Valley	48	−10	24.1	1.22	15.0
Columbia	50	5	27.0	1.55	15.5
Dyer	48	−12	20.5	0.65	6.5
Elko*[1]	35	0	25.0	1.25	12.5
Ely	45[i]	0[i]	25.7[i]	2.50	25.0
Eureka	48	− 3	25.9	4.70	50.0
Fallon	64	− 2	30.7	0.21	0.7
Gardnerville	51[d]	1[d]	24.4[d]	3.55	21.0
Golconda	63	−12	23.8	0.50	5.0
Halleck*[5]	......	......	......	0.42	4.2
Hamilton	50	−10	23.8	4.60	46.0
Hazen	58	12	33.6	1.35	2.3
Humboldt	46	−12	28.2	1.30	8.0
Leetville	59	5	31.4	0.28	2.5
Lewers Ranch	50	1	29.3	8.70	27.0
Logan	67	27	45.6	2.36	0.0
Mill City*[1]	54	4	28.5	0.42	4.0
Palmetto	55	− 8	25.4	8.90	89.0
Paradise Valley	......	......	......	1.87	......
Pioche	43	− 5	25.0	3.08	27.0
Potts	41	−15	19.9	0.80	10.5
San Jacinto	46	−26	22.8	1.70	17.0
Squaw Valley	52	−28	23.8	1.13	11.1
Tecoma	45	−14	18.8	2.90	29.0
Wabuska	60	1	31.2	0.08	0.8
Wadsworth	73	2	39.7	0.95	9.5
New Hampshire.					
Alstead	49	−18	17.8	1.87	20.0
Bartlett	......	......	......	2.14	19.0
Bethlehem	50	−26	13.4	1.40	9.5
Brookline	56	−18	23.5	1.85	13.5
Durham	52	−24	19.4	2.30	20.5
Franklin Falls	48	−18	17.2	2.31	15.0
Groveton	42	−33	......	2.35	19.2
Hanover	47	−28	14.8	1.49	14.7
Keene	51	−26	19.6	1.99	14.0
Nashua	53	−13	20.6	2.39	16.8
Newton	53	−15	20.2	2.94	9.0
North Woodstock	......	......	......	3.42	......
Plymouth	46	−18	17.8	2.03	11.4
New Jersey.					
Asbury Park	69	1	34.2	3.60	10.3
Bayonne	64	0	31.1	3.55	10.7
Belvidere	55	− 4	28.4	3.99	11.3
Bergen Point	62	1	31.2	4.05	13.2
Beverly	65	1	31.7	3.54	11.0
Bridgeton	70	5	35.2	2.89	6.3
Canton	......	......	......	2.40	5.0
Cape May C. H	71	2	36.4	1.93	7.3
Charlotteburg	63[c]	− 7[c]	29.4[c]	3.83	14.0
Clayton	66	3	33.4	2.55	4.3
College Farm	62	− 3	30.5	3.44	10.6
Dover	60	− 3	26.8	3.60	11.0
Elizabeth	61	2	32.6	3.49	14.0
Englewood	64	− 3	30.0	3.39	12.8
Flemington	62	0	30.3	3.85	8.5
Friesburg	69	3	34.0	2.83	4.3
Hightstown	65	− 1	31.0	4.24	11.2
Imlaystown	67	0	31.8	4.44	8.5
Indian Mills	70[d]	2[d]	34.0[d]	3.18	6.0
Jersey City	63	1	32.1	3.52	10.6
Lakewood	70	1	34.0	3.95	8.0
Lambertville	59	1	31.4	3.78	10.5
Layton	64	−19	25.6	3.55	21.3
Moorestown	67	0	32.6	2.93	7.8
Newark	65	− 1	31.1	4.93	14.7
New Brunswick	62	− 2	30.7	3.97	13.0
Newton	64	−11	27.2	2.35	15.5
Oceanic	68	3	34.5	3.45	8.0
Paterson	67	2	32.2	3.47	10.5
Phillipsburg	58	− 2	28.9	3.70	12.7
Plainfield	61	− 1	30.4	3.57	12.2
Pleasantville	......	......	......	2.36	......
Rancocas	......	......	......	3.24	8.2
Rivervale	67	−10[d]	28.3[e]	5.40	21.5
Somerville	60	− 1	30.4	3.94	13.0
South Orange	63	0	29.9	3.24	9.5
Sussex	63	− 8	27.0	2.51	22.0
Toms River	75	0	34.0	4.42	12.0
Trenton	65	− 1	34.0	4.30	8.0
Tuckerton	68	2	35.1	3.11	6.2
Vineland	69	2	34.0	2.30	5.8
Woodbine	68	1	35.6	1.97	3.0
New Mexico.					
Alamagordo	68	21	47.2	1.45	
Albert	70	15	43.8	0.91	T.
Albuquerque	68	19	47.4	......	......
Alto	......	......	......	2.25	8.5
Artesia	73	21	48.8	0.14	
Bellranch	71	12	42.4	0.73	
Bloomfield	60	6	36.0	0.53	0.2
Carlsbad	76	19	49.4	0.10	
Cambray	......	......	......	0.65	
***New Mexico*—Cont'd.**					
Chama	46	−15	25.4	2.03	23.5
Cimarron	64	2	36.4	0.32	3.5
Cliff	70	14	42.8	2.51	
Cloudcroft	48	− 1	31.6	6.32	24.2
Datil	62	− 6	35.4	0.96	1.0
Deming	72	23	45.6	1.42	
Dulce	49	−27	25.4	1.87	15.0
Eagle Rock Ranch	62	1	36.4	0.32	4.0
Elizabethtown	48	−11	25.2	0.90	11.0
Elk	71	20	46.0	0.23	......
El Vado	51	−19	25.8	2.78	
Engle	65[d]	12[d]	43.2[d]	0.25	
Espanola[g]	58	18	37.4	......	......
Estancia	60	7	36.4	0.40	......
Fairview	63[b]	8[b]	36.7[b]	0.68	1.0
Fort Bayard	65	11	41.0	3.35	2.5
Fort Stanton	65	15	40.9	0.25	
Fort Union	59	4	34.8	0.88	
Fort Wingate	54	2	33.9	1.38	7.5
Frisco	61	− 3	38.5	2.65	6.0
Fruitland	57	7	35.6	0.12	1.2
Gage	75	19	42.9	1.41	
Glen	70	12	45.2	0.19	T.
Hillsboro	65	12	45.0	0.62	T.
Hope	......	......	......	0.03	
Laguna	58	9	36.4	0.87	T.
Lagunita	70[g]	12[g]	41.7[g]	0.59	
Lake Valley	......	......	......	1.46	1.0
Las Vegas	64	− 2	37.1	1.57	5.5
Lordsburg	69	22	46.3	2.52	0.7
Los Alamos	......	......	......	0.76	6.0
Los Lunas	64	10	27.8	1.79	
Luna	53	−12	31.1	1.77	......
Magdalena	62	12	38.0	0.81	T.
Manuelito	......	......	......	1.26	7.0
Mesilla Park	71	19	46.8	0.74	T.
Mimbres	......	......	......	2.82	3.0
Mineral Hill	......	......	......	1.67	8.0
Monument	77	20	49.6	0.95	6.0
Mountain Air	57	− 2	37.1	1.38	3.0
Nara Visa	70[d]	14[a]	41.4[c]	1.24	T.
Orange	73	15	46.8	0.63	
Red River	48	− 5	24.0	2.44	25.0
Redrock	......	......	......	1.79	
Rincon	70	16	46.8	1.12	T.
Rociada	58[e]	4	35.1[e]	0.85	4.0
Rosa	......	......	......	0.43	......
Rosedale	56	11	38.2	0.87	2.2
San Marcial	66	16	43.8	0.50	
San Rafael	60	1	36.4	1.36	3.5
Socorro	78	12	42.9	1.05	
Springer	61	3	36.5	0.66	4.0
Strauss	......	......	......	0.50	T.
Taos	55[f]	− 5[f]	33.3[f]	1.42	2.2
Tres Piedras	49	−17	24.2	1.32	15.5
Tucumcari	68	18	44.6	0.24	......
Valley	......	......	......	T.	T.
Vermejo	60	3	33.2	0.21	3.2
Winsor	55	− 1	28.3	3.98	
New York.					
Adams	53	−26	22.0	......	
Addison	66	−19	26.4	2.20	13.5
Amsterdam	51	−17	20.3	2.27	10.2
Angelica	59	−28	24.3	2.27	14.0
Appleton	67	− 2	25.8	2.37	2.9
Arcade	54	−30	21.1	4.52	21.9
Athens	51	−12	23.6	1.85	12.5
Atlanta	56	−22	24.4	3.06	14.6
Atwater	......	......	......	2.38	11.6
Auburn	53	−15	23.7	2.11	13.0
Avon	54	−14	24.4	2.58	7.5
Baldwinsville	53	−18	23.1	4.35	15.0
Balston Lake	46	−26	19.6	2.25	6.7
Bedford	62	− 8	28.0	2.40	7.8
Blue Mountain Lake	......	......	......	2.55	14.5
Bolivar	61	−26	25.4	3.83	16.5
Bouckville	49	−26	18.9	3.13	16.5
Brockport	55	− 5	25.6	3.22	13.0
Cape Vincent	47	−11	17.2	2.55	10.0
Carmel	60	−12	24.6	3.68	13.0
Carvers Falls	45	−28	16.4	2.13	12.0
Chatham	55	−16	23.7	2.12	8.0
Chazy	45	−30	13.7	1.25	8.5
Coeymans	52	−12	22.4	1.70	12.0
Cold Spring Harbor	66	− 1	30.1	4.13	5.4
Cooperstown	50	−27	20.0	3.04	13.0
Cortland	48	−27	22.2	3.50	19.5
Cutchogue	66	0	31.2	4.29	9.0
Dannemora	48	−23	13.6	1.26	7.7
De Ruyter	50	−27	21.4	3.19	9.4
Easton	......	......	......	1.42	9.0
Elba	59	−10	23.7	3.04	13.0
Elmira	67	−15	26.4	2.45	8.1
Faust	50	−32	14.4	1.40	11.5
Fayetteville	55	−20	22.8	2.69	13.0
Fort Plain	52	−20	22.8	3.58	12.0
Franklinville	59	−30	22.9	3.19	14.2
Gabriels	......	−32[d]	13.8[d]	1.19	10.4
***New York*—Cont'd.**					
Gansevoort	......	......	......	2.85	14.5
Glens Falls	45	−19	19.2	2.93	12.0
Gloversville	46	−24	18.8	3.75	13.0
Greenfield	48	−26	19.7	4.97	......
Greenwich	50	−27	19.7	2.00	5.5
Griffin Corners	54	−20	21.6	2.67	14.0
Harkness	46	−22	15.4	0.99	6.0
Haskinville	......	......	......	3.16	13.0
Hemlock	52	−11	25.0	1.61	4.8
Hunt	55	−21	26.7	2.70	9.5
Indian Lake	44	−35	15.2	4.60	46.0
Ithaca	58	−10	24.2	2.68	12.7
Jamestown	62	−17	27.3	4.17	16.5
Jeffersonville	51	−34	22.3	3.22	19.0
Keene Valley	51	−21	16.8	......	......
Lake George	45	−22	18.0	2.58	12.7
Le Roy	56	−12	23.8	2.69	10.6
Liberty	55	−15	21.9	2.68	7.0
Littlefalls, City Res.	52	−18	19.6	3.70	11.0
Lockport	60	− 8	24.8	2.60	......
Lowville	51	−22	17.4	2.31	13.0
Lyndonville	......	......	......	2.17	......
Lyons	53	−18	24.6	4.75	21.0
Middletown	62	− 6	26.8	3.14	16.5
Mohonk Lake	58	−14	24.6	4.84	18.0
Moira	55	−23	13.0	2.18	15.0
Mount Hope	67	− 5	28.7	3.86	11.5
Newark Valley	......	......	......	2.74	19.0
New Lisbon	51	−26	20.6	2.57	15.0
North Lake	45	−35	16.4	5.28	20.0
Norwich	49	−19	24.3	3.53	18.0
Ogdensburg	48	−19	14.0	1.09	5.9
Oneonta	56	−20	24.6	2.50	12.0
Otto	74	−10	24.9	2.39	7.6
Oxford	52	−23	23.6	3.68	19.3
Oyster Bay	63	− 2	30.6	4.27	13.0
Perry City	57	−24	23.2	2.54	11.1
Plattsburg	46	−20	16.2	1.10	7.5
Port Jervis	64	−14	26.2	3.26	18.0
Romulus	53	−12	25.7	2.24	13.5
Salisbury Mills	60	−20	22.0	4.27	11.5
Saranac Lake	43	−28	13.4	1.16	8.0
Scarsdale	64	− 6	29.1	3.60	11.4
Setauket	64	0	31.6	3.74	10.0
Shortsville	54	−15	24.6	2.15	4.6
Skaneateles	......	......	......	3.28	......
Southampton	60	1	32.2	5.15	9.5
South Canisteo	63	−21	24.8	3.25	18.5
Spier Falls	48	−28	18.7	2.41	11.0
Taberg	52	−25	20.1	3.62	12.2
Ticonderoga	42	−22	18.0	2.28	14.5
Volusia	58	− 8	25.3	4.60	23.0
Wading River	68	− 4	30.2	3.86	14.0
Wappinger Falls	62	−15	23.9	3.68	18.0
Warwick	......	......	......	3.00	16.0
Watertown	57	−22	18.8	2.01	9.0
Waverly	67	−22	26.2	3.16	13.5
Wedgwood	56	−11	23.4	2.30	13.5
West Berne	56	−28	20.6	1.96	11.0
Westfield	62	− 9	26.8	5.07	20.0
Westpoint	64	− 4	23.4	2.33	13.3
Windham	56	−26	24.2	1.87	10.0
Youngstown	......	......	......	2.62	6.0
North Carolina.					
Beaufort	73	25	50.8	1.71	
Brevard	74	15	46.5	0.22	T.
Brewers	76[e]	16	46.8[e]	0.42	T.
Buck Springs	65	5	40.1	0.08	T.
Caroleen	80	17	51.2	0.05	
Chalybeate Springs	80	12	47.9	0.78	0.2
Chapelhill	80	13	46.4	0.67	2.0
Clinton	82	18	52.2	0.95	T.
Egletown	79	14	47.2	1.10	1.5
Edenton	74	17	48.6	0.82	1.0
Fayetteville	81	17	51.4	0.40	
Goldsboro	78	17	47.8	1.46	T.
Greensboro	78	13	48.7	0.50	2.0
Greenville	......	......	......	1.08	0.5
Henderson	77	11	46.4	0.95	2.0
Hendersonville	74	16	46.2	0.39	
Horse Cove	69	19	47.9	1.56	T.
Hot Springs	74	18	49.4	0.28	2.0
Kinston	80	17	51.4	1.13	
Lenoir	79	11	45.8	0.40	T.
Lexington	78	7	46.5	0.21	0.1
Lincolnton	77	15	48.6	......	......
Louisburg	78	13	47.4	1.13	1.5
Lumberton	80	18	49.5	0.37	
Marion	77	17	49.3	0.44	T.
Marshall	73	19	46.2	0.26	0.6
Moncure	80	15	48.4	0.79	0.6
Monroe	78	12	49.0	0.24	
Morganton	76	15	47.0	0.48	
Mountairy	75	12	44.8	0.40	1.5
Mount Holly	......	......	......	0.28	
Nashville	81	13	47.9	0.94	1.2
Newbern	80	20	49.9	1.49	
Patterson*[5]	72	16	44.2	0.28	T.

TABLE II.—*Climatological record of cooperative observers*—Continued.

Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
North Carolina—Cont'd.	°	°	°	*Ins.*	*Ins.*
Pinehurst	79	16	51.0	0.61	T.
Pink Beds	68	9	41.0	0.97	
Reidsville	77	13	47.6	0.34	2.0
Rockingham	82[g]	20[g]	50.8[g]	0.55	
Salem	78	6	47.0	0.32	
Salisbury	79	14	48.6	0.32	0.5
Sapphire	69	14	45.6	0.11	T.
Saxon	77	4	46.6	0.21	2.0
Scotland Neck	80	16	49.1	1.28	0.9
Selma	79	18	48.6	1.15	
Settle	78	11	47.7	0.05	0.5
Sloan	80[d]	18[d]	52.8[d]	0.95	
Snowhill	79	14	50.4	0.88	T.
Southern Pines	84	15	51.9	0.46	
Southport	70	22	52.2	2.35	
Statesville	80	14	47.3	0.05	T.
Tarboro	81	16	48.0	1.01	0.8
Vade Mecum	77	5	45.1	0.37	1.5
Washington	81	16	51.0	0.81	0.5
Wash Woods	...	...	...	1.97	
Waynesville	76	14	46.7	0.70	T.
Weldon	80	14	45.4	1.29	1.5
North Dakota.					
Amenia	31	-33	-5.6	1.45	14.5
Aplin	...	...	...	1.30	13.0
Bottineau	19	-38	-8.4	1.05	...
Buford	28	-43	-6.4	0.90	9.0
Cando	22	-42	-11.2	0.58	...
Coalharbor	24	-38	-7.2	1.45	14.5
Dickinson	35	-35	-3.4	0.80	8.0
Donnybrook	25	-35	-8.8	0.75	7.5
Edgeley	31	-31	-4.1	0.42	4.2
Edmore	...	...	...	1.90	19.0
Fargo	35	-27	-3.4	0.34	...
Forman	31	-29	-0.8	1.40	14.0
Fort Berthold	32	-42	-7.6	0.30	...
Fort Yates	35	-31	-0.2	0.74	7.8
Fullerton	33	-29	-1.7	2.82	28.2
Gladys	23	-41	-9.0	1.23	14.0
Glenullin	33	-32	-1.5	1.07	10.7
Grafton	30	-38	-9.2	1.20	12.0
Granville	17[j]	-39	-8.6[e]	1.02	9.5
Hamilton	26	-42	-10.4	1.19	12.2
Hillsboro	32	-32	-4.6	1.24	12.4
Jamestown	31	-33	-2.8	1.81	18.1
Kulm	33	-30	-3.1	3.26	34.5
Lakota	23	-41	-11.2	3.94	22.0
Langdon	28	-37	-9.1	...	...
Lisbon	33	-31	-2.8	2.00	20.0
McKinney	21	-41	-10.4	...	...
Manfred	31	-35	-4.2	1.85	18.5
Mayville	23[b]	-35[b]	-10.6[b]	...	7.8
Medina	30	-31	-1.2	2.50	25.0
Medora	...	...	...	1.37	13.7
Melville	21[d]	-31[d]	-7.4[d]	1.10	11.0
Minot	23	-35	-6.9	1.42	14.2
Minto	29	-33	-8.6	1.91	...
Moyersville	21	-37	-6.4	...	...
Napoleon	28	-35	-6.2	0.80	8.5
New England	33	-33	-0.2	1.30	13.0
New Salem	32	-35	-2.8	1.36	17.3
Oakdale	44	-33	-0.2	2.00	20.0
Oriska	31	-30	-3.4	1.95	19.5
Park River	25	-33	-7.6	1.50	15.0
Pembina	29	-43[c]	-14.1[d]	1.95	19.5
Portal	20	-43[l]	-10.6[f]	0.60	6.0
Power	33	-34	-3.8	1.30	13.0
Pratt	22	-42	-9.4	1.00	10.0
Steele	25	-37	-2.4	1.50	15.0
Valley City	32	-31	-3.3	1.15	11.5
Wahpeton	36	-32	-0.8	...	...
Walhalla	31	-38	-8.4	...	...
Willow City	18	-45	-11.0	1.00	10.0
Wishek	...	...	...	1.60	16.0
Ohio.					
Akron	68	-7	29.7	4.41	9.5
Amesville	71	-21	36.0	6.88	9.5
Atwater	62	-12	27.9	6.04	10.5
Bangorville	64	-6	30.6	7.74	9.5
Bellefontaine	65	-5	31.2	6.77	4.0
Benton Ridge	65	-5	31.3	5.70	9.7
Bladensburg	67	-20	30.6	4.49	13.0
Bowling Green	65	-10	28.2	3.43	7.0
Bucyrus	66	-10	31.4	6.70	13.0
Cadiz	66	-2	32.5	5.43	15.4
Cambridge	69	-20	33.6	5.50	8.0
Camp Dennison	70	-5	37.4	8.80	2.1
Canal Dover	66	-20	30.2	5.83	12.0
Canton	65	-8	31.6	5.95	8.7
Cardington	65	-12	31.0	7.12	9.7
Circleville	70[e]	-9[b]	35.0[d]	6.69	7.0
Clarington	71	-5	35.6	6.55	13.2
Clarksville	68	-9	36.2	8.47	4.6
Cleveland *b*	65	-3	29.2	5.31	16.0
Dayton	68	-1	34.7	8.16	5.6
Defiance	64	-4	29.2	4.12	15.0
Delaware	66	-10	32.0	6.89	7.3
Demos	66	-6	33.3	5.92	13.0
Ohio—Cont'd.					
Findlay	66	2	30.4	6.15	6.0
Frankfort	68	-17	37.0	6.91	8.0
Fremont	66	-4	30.1	5.84	10.0
Garrettsville	65	-20	28.7	5.13	11.9
Granville	67	-13	32.8	5.74	5.2
Gratiot	66	-16	32.2	5.37	8.4
Green	73	-9	40.6	9.55	7.0
Greenhill	65	-23	29.0	5.85	12.3
Greenville	67	-3	32.9	7.24	4.0
Hedges	64	-2	29.8	5.54	4.2
Hillhouse	66	-13	28.8	5.26	12.5
Hiram	63	-4	28.6	5.47	11.5
Ironton	75	0	41.5	7.16	4.5
Jacksonburg	68	-3	34.4	8.54	6.0
Kenton	64	-3	30.2	5.36	4.0
Killbuck	72	-9	31.7	6.77	12.0
Lancaster	73	-15	35.0	6.45	6.0
Lima	65	-2	31.2	5.89	8.5
McConnelsville	71	-11	35.2	5.86	8.9
Mansfield	...	...	...	7.75	...
Marietta	69	-5	38.3	7.87	9.0
Marion	67	-5	31.2	5.01	10.2
Medina	65	-19	28.2	5.25	11.0
Milfordton	65	-11	30.5	6.44	12.5
Milligan	69	-22	35.1	5.95	4.0
Millport	65	-22	30.1	5.24	9.0
Napoleon	63	-3	29.4	5.28	3.0
Nellie	69	-5	31.9	5.13	11.5
New Alexandria	68	-11	33.6	3.58	19.0
New Berlin	64	-10	29.6	5.49	9.0
New Bremen	65	-3	32.4	6.65	3.5
New Richmond	70	-2	38.2	8.00	2.1
New Waterford	65	-20	30.6	5.63	12.0
North Lewisburg	67	-2	32.3	7.15	6.0
North Royalton	64	-8	28.2	5.45	16.5
Norwalk	68	-12	29.9	4.87	8.0
Oberlin	67	-12	29.8	4.81	6.0
Ohio State University	68	-7	33.0	5.29	3.1
Orangeville	63	-19	28.6	2.46	5.0
Ottawa	66	-5	30.6	5.49	7.5
Pataskala	68	-12	32.6	6.71	7.5
Philo	68	-7	34.5	5.01	10.2
Plattsburg	66	-6	34.2	6.70	3.0
Pomeroy	67	-9	35.8	7.14	8.0
Portsmouth	71	1	38.9	8.01	5.5
Pulse	66	11	36.4	8.93	4.0
Rittman	65	-16	29.6	6.42	9.0
Rockyridge	65	-5	28.9	4.47	6.0
Shenandoah	65	-9	29.2	6.03	10.3
Sidney	67	-1	32.9	7.41	5.7
Somerset	66	-2	35.2	4.67	10.5
South Lorain	67	-15	30.0	5.70	10.2
Springfield	...	...	...	7.49	...
Summerfield	69	-20	34.0	5.40	8.1
Thurman	72	-10	41.1	6.61	7.0
Tiffin	65	-4	30.6	5.50	7.2
Toledo (St. Johns College)	64	-2	28.0	4.63	12.4
Upper Sandusky	66	-7	31.6	4.97	7.5
Urbana	67	-8	31.9	6.40	7.2
Vickery	67	-11	28.8	5.75	5.7
Warren	65	-16	29.4	4.01	12.9
Wauseon	64	-6	26.8	3.47	11.9
Waverly	71	-12	37.1	7.81	5.8
Waynesville	68	-4	34.9	7.26	2.5
Wellington	65	-15	30.4	5.13	10.5
Willoughby	...	...	...	4.06	7.0
Wilson	70	-16	37.9	8.67	8.0
Wooster	67	-14	30.8	6.92	10.5
Zanesville	...	...	...	5.01	8.5
Oklahoma.					
Alva	71	12	38.4	2.90	1.0
Arapaho	73	14	41.6	3.02	0.5
Beaver	74[e]	12[e]	38.6[e]	1.74	2.5
Cache	75	10	44.2	2.05	
Chandler	77	11	44.2	1.80	T.
Chattanooga	76	15	45.5	1.15	
Dacoma	69	10	38.8	2.84	
Eldorado	73	15	45.6	1.70	T.
Enid	75	15	38.4	4.84	1.1
Erick	69	14	45.8	2.92	T.
Fort Reno	72[g]	8	38.9[d]	...	...
Fort Sill	75	20	47.4	0.64	
Frederick	77	19	47.0	0.73	
Gage	68	13	37.6	2.20	T.
Grand	60	15	35.4	3.05	T.
Guthrie	75	16	43.6	2.62	0.5
Harrington	67	11	37.8	4.54	T.
Helena	72[e]	13[e]	37.6[e]	3.37	T.
Hennessey	73	15	42.8	4.01	0.6
Hobart	71	16	44.4	2.81	0.5
Hooker	72	12	38.6	0.50	1.0
Jefferson	72	12	40.8	1.75	0.2
Kenton	72	10	39.7	0.27	T.
Kingfisher	72	16	42.6	2.54	T.
McComb	72	22	48.4	1.64	
Mangum	70[b]	12	47.4[d]	2.85	
Meeker	79	15	42.6	1.80	0.5
Neola	72	16	45.2	1.68	T.
Oklahoma—Cont'd.					
Newkirk	73	13	40.0	5.08	
Okeene	78	17[f]	40.8[e]	4.39	
Pawhuska	77	13	41.3	2.44	T.
Perry	73	13	41.4	3.18	0.5
Sac and Fox Agency	75	12	43.6	1.75	T.
Shawnee	74	16	44.7	1.79	0.2
Snyder	72	17	46.0	1.40	T.
Stillwater	75	15	40.5	2.62	T.
Taloga	66	15	39.0	4.35	0.5
Temple	74	17	47.1	1.19	
Vinita	75	10	41.0	3.47	0.5
Waukomis	74	16	41.4	3.72	0.5
Weatherford	70[j]	12[j]	41.6[j]	1.52	0.1
Whiteagle	73	14	40.1	4.41	T.
Oregon.					
Alba	...	...	...	1.62	...
Albany	59	10	36.2	7.54	...
Ashland	57	17	37.4	2.87	5.8
Astoria	52	18	37.6	13.54	4.0
Aurora (near)	54	8	34.2	6.78	...
Bay City	71	12	38.8	11.93	6.2
Bend	56	-19	25.3	6.34	36.0
Beulah	50	0	22.6		
Blalock	51	0	26.9	3.20	13.9
Buckhorn	56	19	37.9	14.62	9.3
Bullrun	49	10	32.5	12.52	7.5
Burns	47	-8	23.2	2.08	18.0
Carlton	53	6	33.3	7.95	4.5
Cascade Locks	50	5	29.1	11.95	48.0
Coquille	...	...	...	12.19	1.5
Corvallis	52	7	35.4	8.97	3.0
Dale	...	...	...	2.77	9.3
Dayville	56	-4	30.0	0.96	3.0
Doraville	54	4	31.4	8.03	17.1
Drain	60	11	37.3	10.98	2.5
Echo	56[e]	1[e]	25.0[e]	1.87	15.5
Ella	56	-10	23.5	1.45	13.0
Eugene	54	10	35.7	7.91	0.5
Fairview	65	26	42.4	13.10	7.5
Falls City	52	9	32.8	16.31	4.3
Forestgrove	54[e]	4[e]	32.8[e]	8.11	6.0
Gardiner	58	20	41.1	13.24	
Glendale	54	21	37.8	11.08	1.0
Glenora	50	5	32.3	17.57	22.0
Gold Beach	59	26	43.7	18.43	11.4
Government Camp	58	-4	25.2	10.75	58.0
Granite	56	-14	21.6	1.62	
Grants Pass	59	20	38.2	8.04	2.2
Grass Valley	42	-14	24.4	2.65	13.2
Heisler	53	-19	26.2	1.92	5.7
Heppner	55	-7	24.5	2.25	11.5
Hermiston	...	...	...	2.14	14.0
Hood River	51	-5	26.5	5.97	43.0
Huntington	57	-2	27.6	1.95	18.0
Jacksonville	63	16	37.0	4.94	4.5
Joseph	45	-10	19.9	1.63	11.0
Lagrande	58	-3	26.3	1.64	11.5
Lakeview	46	-2	23.8	3.39	23.0
Lost River	46	-7	25.8	1.11	5.0
McKenzie Bridge	48	0	30.7	12.81	...
McMinnville	54	11	34.6	7.54	4.2
Marshfield	65	24	43.2	13.45	6.8
Mill City	57	10	34.6	6.02	0.1
Mitchell	53	-13	25.8	1.60	12.5
Monroe	52[e]	10[e]	34.0[e]	...	2.5
Mountain Park	47	-5	24.2	13.34	65.8
Mount Angel	58	8	35.6	8.61	6.2
Nehalem	...	...	...	13.88	2.0
Newport	62	15	42.4	9.50	T.
Odell	...	...	...	4.76	26.0
Olex	52	-5	22.9	1.92	13.5
Paisley	52	-9	27.0	1.03	...
Pendleton	54	-8	24.4	1.99	12.0
Port Orford	57	30	44.2	19.56	...
Prineville	47	-20	24.6	1.14	...
Richland	56	0	28.2	0.71	7.0
Riverside	56	-4	27.6	0.69	3.5
Salem	52	12	35.8	8.01	...
Silver Lake	58	-19	18.2	1.11	...
Sparta	49	3	25.2	0.85	7.0
Stafford	57	6	33.9	8.01	3.5
The Dalles	53	-4	27.1	3.92	28.5
Toledo	53	14	38.5	14.24	4.4
Umatilla	56	-5	25.8	1.79	1.7
Vale	56	-8	26.2	3.53	11.5
Van	...	...	...	1.30	14.0
Wallowa	52	-18	18.6	1.99	21.0
Warm Spring	53	-19	25.2	3.31	15.0
Weston	56	-8	22.2	4.96	32.0
Williams	59	14	37.4	7.52	2.0
Pennsylvania.					
Aleppo	69	-15	34.0	7.03	15.0
Altoona	63	-13	28.6	5.31	2.9
Baldwin	62	-13	29.4	2.85	10.2
Beaver Dam	...	...	...	6.83	...
Bellefonte	66	-14	29.9	5.00	23.0
Browers Lock	...	...	...	3.72	...
California	72	-4	36.7	5.03	12.2

TABLE II.—*Climatological record of cooperative observers*—Continued.

Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
Pennsylvania—Cont'd.	°	°	°	*Ins.*	*Ins.*
Cassandra	60	—10	30.0	3.92	14.0
Centerhall	61	—12	26.6	2.14	9.0
Clarion	.....	.....	.....	5.28	13.3
Claysville	68	—17	33.8	3.92	12.8
Clearfield	.....	.....	.....	4.88	18.0
Coatsville	70	1	31.8	3.41	9.3
Confluence	.....	.....	.....	9.69	1.6
Caraopolis	.....	.....	.....	4.74	.....
Davis Island Dam	.....	.....	.....	5.32	11.4
Derry	68	—18	33.8	5.46	16.5
Doylestown	.....	.....	.....	4.81	.....
Drifton	62	—12	27.8	3.50	14.7
East Mauch Chunk	62	— 6	28.8	3.69	15.2
Easton	58	— 1	30.4	3.40	11.5
Ellwood Junction	.....	.....	.....	5.52	8.0
Emporium	60	—20	27.2	4.68	22.9
Ephrata	59	— 3	30.0	3.09	6.7
Everett	66	— 7	29.0	3.78	14.5
Forks of Neshaminy	.....	.....	.....	3.74	.....
Franklin	64	—18	29.2	4.84	11.0
Freeport	67	—14	33.1	6.67	9.9
George School	66	0	31.6	4.12	9.3
Gettysburg	68	— 1	31.5	3.17	13.2
Girardville	.....	.....	.....	4.66	21.5
Gordon	55	—13	27.2	3.89	13.0
Greensboro	.....	.....	.....	7.60	9.0
Greenville	64	—16	29.0	6.18	15.0
Grove City	64	—20	30.0	4.51	8.6
Hamburg	55	— 2	29.8	3.20	11.8
Hanover	70	2	34.0	2.51	9.0
Herrs Island Dam	.....	.....	.....	5.27	11.8
Huntingdon	65	— 9	30.1	4.51	10.5
Hyndman	67	—10	33.1	5.28	10.0
Indiana	66	— 9	31.6	5.18	9.5
Irwin	75	—14	35.5	6.49	13.3
Johnstown	63	—10	33.0	7.29	11.2
Kennett	67	2	32.2	3.78	12.0
Lansdale	.....	.....	.....	3.32	.....
Lawrenceville	65	—20	26.7	3.36	18.0
Lebanon	61	— 4	30.3	3.70	7.6
Leroy	63	—11	25.3	2.97	17.6
Lewisburg	59	—21	28.1	3.40	14.2
Lockhaven	53	—12	28.5	3.97	16.5
Lock No. 4	.....	.....	.....	5.50	8.7
Lycippus	68	— 9	34.2	6.85	14.8
Marion	68	0	31.4	3.89	12.0
Mauch Chunk	.....	.....	.....	4.32	15.0
Mifflintown	62	—13	28.7	4.15	13.5
Milford	65	—12	25.8	4.07	15.3
Montrose	63	—17	23.8	4.03	24.0
New Germantown	65	—10	31.0	3.70	12.0
Ottsville	.....	.....	.....	3.48	.....
Parker	.....	.....	.....	4.40	9.4
Philadelphia	65	5	34.8	3.21	7.6
Pocono Lake	57	—23	22.7	3.21	15.0
Point Pleasant	.....	.....	.....	3.67	.....
Pottsville	.....	.....	.....	3.55	.....
Reading	59	— 1	31.1	3.62	9.4
Renovo	.....	.....	.....	3.74	20.0
Saegerstown	63	—21	27.7	5.29	16.5
St. Marys	58	—16	24.8	3.64	17.0
Saltsburg	.....	.....	.....	5.66	8.5
Seisholtzville	.....	.....	.....	3.49	.....
Selinsgrove	54	—11	29.6	3.26	12.5
Shawmont	.....	.....	.....	2.97	.....
Skidmore	60[j]	—16[j]	29.6[j]	.....	.....
Smiths Corners	.....	.....	.....	3.50	.....
Somerset	61	—14	29.4	7.77	20.4
South Eaton	64	—10	28.6	2.64	12.0
Springdale	.....	.....	.....	5.87	9.7
Springmount	.....	.....	.....	3.39	.....
State College	62	—10	29.0	3.82	12.2
Towanda	66	—19	26.6	2.82	14.6
Troutrun	.....	.....	.....	3.26	18.1
Uniontown	70	— 7	33.6	6.52	12.0
Warren	64	—17	27.8	4.71	21.7
Wellsboro	64	—23	26.0	2.35	14.2
Westchester	68	1	32.1	4.16	9.5
West Newton	.....	.....	.....	6.08	11.0
Whitehaven	59	— 5	26.2	3.13	.....
Wilkesbarre	61	— 8	29.4	2.86	19.0
Williamsport	54	— 9	29.1	3.38	16.0
Rhode Island.					
Bristol	57	— 5	29.2	3.17	10.0
Kingston	61	— 9	27.2	4.11	12.0
Pawtucket	61	— 1	29.2	7.57	13.5
Providence	62	— 6	28.4	3.40	16.5
South Carolina.					
Aiken	76	25	53.8	1.35	
Allendale	77	28	55.4	0.84	
Anderson	76	23	51.2	0.62	
Batesburg	77	20	52.4	0.56	
Beaufort	77	29	57.7	0.66	
Bennettsville	83	20	50.0	0.41	
Blackville	79	25	55.0	0.74	
Blairs	.....	.....	.....	0.36	
Bowman	79	24	53.5	1.67	
Calhoun Falls	.....	.....	.....	0.55	
South Carolina—Cont'd.					
Camden	77	20	52.3	0.67	
Catawba	.....	.....	.....	T.	
Chappells	.....	.....	.....	0.77	
Cheraw	79	21	49.4	0.47	
Clarks Hill	77	21	53.4	1.57	
Clemson College	73	21	52.1	1.16	
Conway	89	22	52.8	0.85	
Darlington	81	18	51.6	0.42	
Dillon	81	18	51.6	0.27	
Due West	75	24	52.2	1.02	
Edisto	.....	.....	.....	0.76	
Effingham	.....	.....	.....	0.51	
Florence	89	22	51.9	0.26	
Georgetown	76	25	54.3	1.91	
Greenville	75	20	47.2	0.38	
Greenwood	72	21	50.8	0.44	
Heath Springs	76	20	51.0	0.86	
Kingstree	78	28	56.2	0.86	
Liberty	74	22	51.3	0.76	T.
Little Mountain	78	22	52.4	0.71	
Newberry	77	21	51.8	1.00	
Pelzer	.....	.....	.....	0.56	
St. George	76	27	56.2	1.23	
St. Matthews	76	24	52.8	0.83	
St. Stephens	.....	.....	.....	1.09	
Saluda	77	19	52.3	0.81	
Santuck	77	19	50.7	0.50	
Smiths Mills	.....	.....	.....	0.25	
Society Hill	76	22	50.4	0.44	
Spartanburg	79	19	49.8	0.38	
Stateburg	78	23	54.8	0.79	
Summerville	80	26	56.8	0.95	
Trenton	74	23	52.6	1.07	
Trial	79	23	55.5	0.82	
Walhalla	80	23	52.7	0.58	
Walterboro	83	27	54.7	0.94	
Winnsboro	78	22	53.3	1.70	
Winthrop College	78	20	51.0	0.33	
Yemassee	77	27	55.0	1.37	
South Dakota.					
Aberdeen	38	—27	—0.6	1.55	15.5
Academy	46	—18	10.0	1.10	13.4
Alexandria	40	—21	8.0	1.60	10.0
Armour	42	—22	11.8	.....	8.5
Ashcroft	46	—23	8.6	0.60	6.0
Bowdle	30	—27	1.8	2.70	27.0
Brookings	39	—22	4.8	1.06	10.6
Canton	40	—25	12.4	0.80	8.0
Castlewood	36	—25	3.2	0.43	.....
Centerville	40	—23	12.5	0.43	4.3
Chamberlain	46	—20	8.6	1.94	21.1
Cherry Creek	40	—25	4.2	0.64	.....
Clark	42	—27	1.2	1.36	13.6
Clear Lake	35	—24	2.8	1.10	11.0
Desmet	39	—22	5.2	1.30	11.5
Dolan	35	—28	4.2	1.09	11.5
Elkpoint	46	—22	15.4	0.44	5.0
Fairfax	40	—22	8.0	0.90	9.0
Faulkton	37	—25	1.6	1.40	14.0
Flandreau	37	—21	6.6	0.87	8.0
Forestburg	38	—28	3.7	1.74	17.4
Fort Meade	60	—23	11.6	0.60	6.0
Frederick	35	—32	0.2	1.57	15.0
Gannvalley	39	—21	5.6	2.00	20.0
Gregory	.....	.....	.....	1.55	9.0
Hermosa	54	—20	13.5	0.75	7.5
Highmore	41	—27	4.0	1.00	10.0
Howard	36	—20	4.8	0.25	3.0
Howell	39	—29	2.4	0.83	7.7
Ipswich	36	—28	—1.5	1.78	11.0
Kennebec	39	—23	8.4	2.18	16.4
Kidder	35	—33	—0.5	1.22	3.2
Kimball	42	—17	6.8	1.59	.....
Little Eagle	33	—29	—0.6	2.95	28.0
Marion	41	—20	10.4	.....	.....
Mellette	38	—29	0.8	0.54	5.9
Menno	42	—21	10.6	0.65	6.5
Milbank	39	—27	0.5	2.50	19.0
Mitchell	45	—20	8.0	1.05	26.6
Mound City	31	—30	—0.8	1.20	12.0
Oelrichs	45	—21	12.0	1.00	10.0
Orman	50	—28	10.2	0.91	11.0
Pine Ridge	52	—15	17.4	0.67	6.7
Plankinton	.....	.....	.....	1.21	12.0
Redfield	36	—27	1.0	1.19	12.0
Roslyn	35	—27	.....	1.09	10.6
Sioux Falls	39	—21	8.6	1.01	8.1
Spearfish	58	—23	16.8	0.68	10.5
Stephan	40	—23	3.5	1.90	16.4
Tyndall	40	—21	10.7	0.95	9.5
Vermillion	53	—19	16.6	0.50	5.0
Warnecke	35	—27	0.8	0.50	5.0
Watertown	35	—23	2.2	1.85	15.9
Wentworth	39	—21	6.2	0.97	9.7
Whitehorse	38	—29	1.2	0.87	8.7
Woolsey	.....	.....	.....	1.47	14.7
Tennessee.					
Ashwood	75	8	49.3	2.29	1.5
Tennessee—Cont'd.	°	°	°	*Ins.*	*Ins.*
Benton	75	19	51.6	1.17	T.
Birds Bridge	.....	.....	.....	1.12	0.5
Bluff City	.....	.....	.....	1.50	0.2
Bolivar	76	14	46.8	2.12	T.
Bristol	67	5	44.4	1.92	1.5
Brownsville	73	12	47.1	3.69	2.0
Byrdstown	74	10	48.2	3.34	0.6
Carthage	.....	.....	.....	2.46	T.
Cedar Hill	75	3	47.3	4.74	5.5
Celina	.....	.....	.....	2.13	
Charleston	.....	.....	.....	1.24	
Clarksville	75	3	46.8	4.25	8.5
Clinton	.....	.....	.....	1.71	1.3
Covington	75	14	48.0	3.40	2.0
Dandridge	.....	.....	.....	1.08	0.1
Decatur	76	15	49.3	1.89	1.0
Dickson	76	8	48.4	3.24	3.0
Dover	79	5	48.8	4.46	5.0
Dyersburg	76	11	45.8	5.90	3.0
Elizabethton	71	10	48.0	0.46	2.0
Erasmus	72	15	45.9	3.12	0.2
Florence	74	12	49.5	2.95	2.5
Franklin	74	15	47.9	2.39	0.5
Harriman	74	14	47.2	1.30	0.5
Hohenwald	76	10	47.6	3.12	1.2
Iron City	76	11	50.4	3.20	T.
Jackson	76	12	50.8	2.69	2.8
Johnsonville	78	4	48.9	2.99	4.0
Jonesboro	77	16	48.4	1.55	1.0
Kenton	76	8	47.6	5.41	3.0
Kingston	.....	.....	.....	1.75	1.0
Lafayette	76	5	48.2	3.18	1.4
Lewisburg	75	14	49.7	1.93	0.7
Loudon	.....	.....	.....	1.15	T.
Lynnville	73	15	47.8	2.20	T
McGee	.....	.....	.....	0.45	1.0
McMinnville	75	11	50.0	2.42	0.3
Maryville	74	15	49.6	1.45	1.0
Newport	73	15	47.4	0.90	1.0
Palmetto	76	12	49.8	1.77	T.
Pinewood	74	2[d]	48.2	2.80	2.5
Pope	79	11	49.2	3.72	2.0
Rogersville	72	1	46.6	1.61	2.0
Rugby	72	4	46.0	2.26	0.5
Savannah	76	12	49.8	3.74	5.0
Sevierville	76	16	48.4	1.15	1.5
Sewanee	69	12	47.8	2.05	.....
Silver Lake	64	6	42.4	1.60	1.0
Sparta	73	10	48.7	1.31	0.5
Springdale	75	— 5	45.8	1.80	4.0
Springville	79	1	48.2	3.99	3.2
Tazewell	.....	.....	.....	1.62	1.3
Tellico Plains	76	19	51.3	1.92	0.8
Tracy City	69	12	46.6	2.12	
Trenton	76	8	48.2	4.55	3.0
Tullahoma	73	14	49.5	1.93	T.
Union City	76	7	46.3	8.20	2.5
Watertown	77	8	49.4	.....	
Waynesboro	75	15	50.4	4.08	1.5
Wildersville	72	12	49.4	4.29	3.0
Yukon	73	15	49.8	2.84	
Texas.					
Albany	81	17	51.4	2.36	
Alvin	.....	.....	.....	2.36	
Arthur	.....	.....	.....	4.10	
Austin	80	26	59.2	0.41	
Ballinger	81	17	57.0	0.25	
Barstow	75	22	49.4	0.00	
Beaumont	.....	.....	.....	0.69	
Beeville	84	33	63.1	0.55	
Big Springs	78	23	52.6	0.17	T.
Blanco	82	22	56.7	0.78	
Boerne	78	22	57.6	0.20	
Bonham	80	20	53.0	1.81	T.
Booth	.....	.....	.....	2.15	
Bowie	81	17	51.2	T.	
Brenham	83	28	59.9	1.55	
Brighton	78	42	65.4	0.10	
Brownwood	86	22	55.0	0.75	
Canadian	73	12	41.4	1.03	
Channing	73	13	42.8	1.31	T
Childress	73	17	45.3	2.55	
Clarksville	78	21	52.2	1.35	T.
Claude	70	12	39.8	.....	
Claytonville	77	23	54.4	0.00	
Coleman	82	20	55.2	0.50	
College	80	35	61.0	1.15	
Colorado	83	21	53.6	0.21	
Columbus	.....	.....	.....	1.23	
Corsicana	79	25	56.0	0.62	
Cotullo	78	40	59.8	0.57	
Crockett	81	29	49.9	1.54	
Cuero	80	31	58.8	0.84	
Dallas	80	23	53.4	1.07	
Dalhart	76	13	45.6	0.87	.....
Danevang	84	31	60.6	2.96	
Decatur	80	18	52.0	.....	
Denison	.....	.....	.....	0.10	

TABLE II.—*Climatological record of cooperative observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Texas—Cont'd.	°	°	°	*Ins.*	*Ins.*
Dialville	79	26	57.2	1.38	
Duval	79	26	58.9	0.46	
Eagle Pass	92	30	60.0	0.25	
Fort Clark	84	30	60.6	0.05	
Fort McIntosh	90	32	67.2	0.60	
Fredericksburg	79[e]	23[e]	57.0[e]	0.47	T.
Gainesville	78[d]	20[d]	50.4[d]	1.59	......
Gatesville	80	23	57.3	2.52	
Georgetown	82	25	58.0	0.62	
Gonzales	......	......	......	0.49	
Graham	83	13	52.2	0.46	
Grapevine	80	21	53.6	1.81	2.5
Greenville	79	22	53.4	2.29	
Hebbronville	......	......	......	0.20	
Hallettsville	83	31	63.4	0.25	
Haskell	82	18	50.4	0.90	
Hempstead	......	......	......	2.38	
Henrietta	79	10	45.2	3.55	
Hillsboro	80	23	55.8	1.19	
Hondo	83	30	59.8	0.40	
Houston	80	34	61.6	1.76	
Hubbard	89	24	55.5	0.90	
Huntsville	80[e]	30[e]	59.2[e]	1.72	
Jewett	83	28	60.0	1.40	
Kaufman	79	24	55.2	1.20	
Keene	80	22	54.9	0.64	
Kent	81	26	55.2	T.	
Kerrville	79	21	58.0	1.04	
Knickerbocker	80	21	54.6	T.	
Kopperl	......	......	......	0.80	
Lampasas	83	22	55.2	0.47	
Liberty	82	30	62.4	0.61	
Llano	83	24	58.6	0.40	
Longlake	......	......	......	1.98	
Lone Star Ranch	......	......	......	1.11	
Longview	78	26	55.8	2.23	
Lufkin	82	29	60.0	1.12	
Luling	82	28	60.8	0.67	
Mexia	80	25	56.1	0.76	
Miami	73	16	42.6	1.33	
Mount Blanco	72	15	46.6	1.63	
Nacogdoches	......	......	......	2.96	
Nazareth	70	15	44.4	1.31	T.
New Braunfels	89	28	61.0	0.24	
Ochiltree	......	......	......	0.87	
Panter	......	......	......	0.50	
Paris	78	22	52.6	3.60	
Pierce	85	30	62.7	2.56	
Plemons	73	14	40.8	0.94	1.0
Port Lavaca	80	40	63.8	0.94	
Rhineland	78	18	50.0	1.00	
Riverside	......	......	......	2.45	
Rockisland	82	30	62.1	1.01	
Rockland	......	......	......	0.96	
Rockport	78	42	62.0	0.00	
Sabinal	86	28	60.5	0.25	
San Marcos	81	27	59.0	0.90	
San Saba	83	19	55.6	0.45	
Seymour	78	18	49.0	0.70	
Sherman	80	21	53.6	0.12	
Sonora	83	20	54.9	0.42	
Sulphur Springs	85	22	55.2	1.27	T.
Temple	81	23	55.9	1.21	
Tilden	91[d]	26[d]	66.1[d]	0.35	
Valley Junction	......	......	......	0.40	
Victoria	83	33	63.4	0.57	
Waco	82	26	58.4	1.54	
Waxahachie	81	23	53.6	1.37	
Weatherford	79	19	51.3	0.63	
Wichita Falls	70	20	44.8	1.18	
Willis	83	31	62.0	3.14	
Willspoint	79	23	56.0	1.47	
Utah.					
Alpine	......	......	......	1.97	10.0
Aneth	56	12	38.3	0.85	
Beaver	66	14	42.2	1.20	12.0
Blackrock	47	−6	28.7	1.85	14.2
Castledale	49	0	21.4	0.00	
Castle Rock	......	......	......	1.92	28.0
Cedar City	48	6	32.0	0.93	7.8
Corinne	51	−10	24.0	1.50	15.0
Deseret	50	−4	29.7	1.66	6.0
Emery	45	1	25.5	1.10	11.0
Enterprise	......	......	......	3.27	39.0
Escalante	50	1	29.3	2.90	14.0
Experiment Farm	66	21	40.2	......	
Farmington	48	4	29.4	3.43	34.2
Fillmore	57	7	33.3	1.67	......
Fort Duchesne	42	−15	18.2	0.50	5.0
Frisco	62	5	32.0	1.12	......
Garrison	49	−5	26.8	0.64	5.0
Government Creek	46	−4	26.7	2.00	28.5
Grantsville	......	......	......	1.45	
Grayson	57	11	33.4	2.60	4.0
Heber	46	−10	24.6	3.00	48.0
Henefer	50	−15	24.8	3.35	29.5
Hite	59	23	40.4	0.53	T.
Huntsville	......	......	......	4.31	49.0
Utah—Cont'd.					
Ibapah	49	−6	24.2	2.51	33.4
Kelton	......	......	......	1.70	17.0
La Sal	46[e]	−1[e]	28.4[e]	0.60	6.0
Levan	45	4	27.8	3.04	24.3
Loa	47	0	22.6	0.00	
Logan	41	−15	20.5	4.85	......
Manti	47	5	29.0	1.65	......
Marion	......	......	......	3.89	43.5
Marysvale	54	−1	29.5	0.35	33.2
Meadowville	44	−3	23.8	3.10	31.5
Millville	......	......	......	3.68	
Minersville	......	......	......	3.03	16.0
Moab	54	12	37.4	1.18	2.0
Morgan	48	−11	26.4	2.88	33.8
Mount Nebo	45	7	30.0	1.23	10.5
Mount Pleasant	52	4	29.0	2.27	18.0
Nephi	......	......	......	1.82	24.0
Oak City	50	2	28.1	1.80	18.0
Ogden	46	1	27.7	4.30	39.3
Panquitch	......	......	......	0.80	8.0
Parowan	48	−2	30.0	1.15	10.3
Park City	41	−1	23.0	10.96	109.6
Payson	......	......	......	3.51	33.0
Pinto	47	−17	25.0	2.63	......
Plateau	53	−7	26.7	1.00	10.3
Provo	45[g]	2	29.4[d]	3.30	24.0
Ranch	50	−20	23.2	6.69	......
Randolph	......	......	......	0.43	10.5
Richfield	59	12	35.2	1.40	5.0
St. George	66	22	41.9	2.42	
Salt Air	44	5	28.2	2.41	......
Scipio	50	−8	28.4	2.39	19.0
Snowville	47	−18	20.0	2.65	26.0
Sunnyside	......	......	......	0.85	8.5
Theodore	39	−10	19.0	1.30	13.0
Thistle	53	−3	28.8	3.80	38.0
Tooele	49	9	34.6	1.87	......
Tropic	50	−20	23.9	3.60	36.0
Trout Creek	48	−5	23.6	1.85	18.5
Verdure	......	......	......	2.75	......
Vernal	48	−3	20.2	0.51	5.1
Woodruff	43	−19	18.2	1.00	10.0
Vermont.					
Bloomfield	48	38	11.4	1.85	15.4
Cavendish	52[d]	−21[d]	17.0[d]	1.05[d]	14.7
Chelsea	47	−24	13.2	1.84	14.0
Cornwall	45	−18	17.0	1.35	9.0
Enosburg Falls	52	−28	13.8	2.22	8.6
Jacksonville	48	−31	21.2	2.89	32.3
Manchester	52	−25	20.0	1.65	10.5
Norwich	46	−28	14.8	2.60	14.0
St. Johnsbury	49	−34	12.8	1.58	15.4
Wells	48	−22	17.0	2.04	6.5
Woodstock	46	−36	13.3	1.77	17.0
Virginia.					
Arvonia	81	−6	42.8	1.07	2.0
Ashland	75	7	41.0	0.83	2.5
Barboursville	76	4	41.4	1.57	1.5
Beechwood	71	3	44.7	2.12	3.9
Blacksburg	69	−5	40.8	1.97	2.0
Buchanan	......	......	......	1.61	2.0
Burkes Garden	64	6	40.4	1.93	2.0
Callaville	76	6	43.9	1.79	2.0
Charlottesville	77	9	40.9	1.77	2.0
Clarksville	......	......	......	0.66	2.1
Columbia	77	0	41.6	1.69	1.7
Dale Enterprise	71	2	38.5	2.02	2.0
Danville	77	0	44.3	1.06	2.0
Doswell	79	6	43.9	1.56	1.2
Elk Knob	68	8	44.4	2.71	3.0
Fredericksburg	77	8	38.8	2.09	1.5
Grahams Forge	70[e]	10[e]	42.3[e]	0.59	0.2
Hampton	73	19	45.7	1.38	2.8
Hot Springs	66	1	39.5	3.33	2.0
Lexington	74	10	40.8	1.29	1.5
Lincoln	74	4	33.9	3.36	4.0
Marion	66	5	43.4	1.14	1.5
Mendota	......	......	......	1.93	2.0
Newport News	73	16	45.2	1.91	2.8
Nokesville (near)	75	9	36.4	2.13	2.5
Petersburg	78	13	45.6	0.82	2.5
Quantico	69	8	37.0	2.34	3.2
Radford	......	......	......	1.64	1.0
Randolph	......	......	......	0.30	4.0
Riverton	......	......	......	2.65	7.0
Roanoke	73[d]	15[d]	47.1[e]	0.68	0.5
Rockymount	75	7	45.2	0.76	2.0
Shenandoah	......	......	......	1.53	1.1
Speers Ferry	......	......	......	2.64	4.0
Spottsville	76	7	45.2	2.31	2.0
Staunton	71	6	42.1	1.69	1.0
Stephens City	72	4	35.8	2.74	6.0
Warsaw	72	7	40.2	2.00	1.5
Williamsburg	......	......	......	0.60	3.0
Woodstock	73	1	37.0	2.43	4.5
Washington.					
Aberdeen	51	12	34.8	11.40	5.0
Anacortes	48[e]	10[e]	31.6[e]	1.40	1.0
Washington—Cont'd.					
Ashford	......	......	......	13.21	......
Baker	46	−1	27.2	6.81	33.1
Bellingham	......	......	......	5.43	......
Bogachiel	50	10	33.4	15.71	14.0
Brinnon	52	11	32.2	4.67	7.5
Cedar River	......	......	......	4.65	11.3
Centralia	49	3	32.6	6.66	2.9
Cheney	52	1	20.4	1.85	18.5
Clearbrook	47	4	23.2	4.67	16.0
Clearwater	48	13	32.9	16.59	10.0
Cle Elum	46	−16	16.0	4.69	63.5
Colfax	46	−12	22.2	2.67	......
Colville	45	−22	14.5	1.92	19.2
Conconully	40	−21	9.4	0.75	10.6
Coupeville	53	11	32.4	1.37	4.0
Crescent	42	−14	16.6	2.23	22.0
Easton	......	......	......	11.30	96.0
East Sound	49	4	31.2	4.29	5.0
Ellensburg	43	−23	11.2	2.09	21.2
Ephrata	48	−9	16.3	1.00	10.0
Fort Simcoe	50	−4	22.2	3.86	24.4
Goldendale	55	−13	24.0	......	......
Hatton	49	−13	19.2	1.26	15.3
Ilwaco	58	14	38.4	12.81	5.3
Kennewick	53	−4	22.6	1.25	12.5
Kiona	53	−5	23.6	1.55	12.0
Kosmos	68	6	32.9	8.96	12.0
Lacenter	55	4	32.0	7.47	11.0
Lakeside	41	−3	14.7	1.02	13.5
Lester	50	2	26.2	7.50	35.5
Loomis	37	−11	11.8	2.60	26.0
Lucerne	42	1	23.6	2.40	32.7
Mottinger Ranch	58	1	26.8	1.81	9.2
Mount Pleasant	56	4	31.4	7.55	6.0
Moxee	50	−17	18.8	1.40	12.5
Northport	41[c]	−22[b]	12.4[c]	2.95	29.5
Odessa	43	−12	16.2	1.40	......
Olga	47	13	31.5	2.29	2.0
Olympia	53	6	33.1	7.22	2.0
Pinehill	45	−9	24.8	6.66	46.4
Pomeroy	49	3	26.1	2.21	20.8
Port Townsend	52	15	33.8	2.08	7.5
Pullman	46	−8	19.3	4.32	33.4
Quiniault	46	11	32.1	14.85	14.4
Rattlesnake	47[i]	−7	18.2[e]	2.65	16.5
Rex Creek	45	5	23.2	2.94	32.0
Ritzville	......	......	......	2.30	18.7
Rock Lake	......	......	......	1.52	12.5
Rosalia	46	−7	18.8	2.03	14.8
Ruby Hill	39	−16	10.0	1.14	16.1
Sedro	45	8	29.2	3.32	5.3
Sixprong	53	−6	23.4	2.98	18.0
Snohomish	50	1	30.5	3.42	10.2
Snoqualmie	49	4	29.2	5.12	28.4
Stehekin	46	−7	19.4	3.98	63.3
Stokes	44	0	14.8	1.90	27.0
Sunnyside	53	−11	21.4	1.39	10.5
Touchet	......	......	......	1.93	14.0
Twisp	38	−28	5.4	1.16	17.0
Vancouver	57	5	32.9	6.55	3.7
Vashon	51	13	34.5	4.14	......
Wahluke	51	−8	21.0	1.52	11.0
Waterville	48	−13	12.2	1.10	11.0
Wenatchee (near)	46	−5	16.4	2.10	29.8
Wilbur	38	−19	12.6	1.39	14.0
Yale	52	9	32.6	12.14	25.5
Zindel	55[d]	2[d]	26.9[d]	2.53	19.9
West Virginia.					
Bancroft	73	0	39.6	7.13	3.0
Bayard	67	−10	33.2	9.42	12.0
Beckley	71	−9	40.4	7.01	6.0
Bens Run	70	−3	36.7	8.36	7.0
Berkley Springs	70[h]	8[h]	37.2[h]	2.68	7.6
Bluefield	70	4	44.0	2.65	......
Burlington	69	4	34.9	3.40	7.0
Cairo	75	−12	39.0	10.42	6.0
Central	71	−14	36.8	7.94	5.2
Charleston	72	5	45.2	5.12	2.0
Creston	70	−9	38.4	7.29	5.0
Cuba	73	−15	39.0	6.31	1.0
Elkhorn	69	2	45.8	3.33	1.0
Fairmont	70	−7	37.2	7.70	8.0
Franklin	68	4	38.6	2.42	2.5
Glenville	74	−6	41.2	7.45	4.0
Grafton	75	−3	38.6	7.70	6.0
Green Sulphur Springs	72	0	40.4	5.42	1.0
Harpers Ferry	......	......	......	3.05	5.0
Hinton	68[e]	17[e]	42.7[e]	3.01	1.8
Huntington	72	3	39.2	6.56	2.2
Leonard	65	6	40.0	......	
Lewisburg	70	−2	40.2	3.81	1.2
Logan	74	5	46.5	6.34	3.0
Lost City	66	8	37.6	2.35	3.5
Lost Creek	73	−8	39.0	8.04	3.0
Madison	74	−1	36.8	......	......
Mannington	70	−12	36.6	8.33	7.2
Martinsburg	71	4	32.8	3.00	13.5
Moorefield	71	0	36.8	2.90	6.0

TABLE II.—*Climatological record of cooperative observers*—Continued. *Late reports for December, 1906.*

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
West Virginia—Cont'd.	°	°	°	*Ins.*	*Ins.*
Mooresville	......	......	......	7.99	6.0
Morgantown	69	— 7	36.6	7.51	8.0
Moundsville	71	—12	36.6	5.77	12.0
New Cumberland	68	—13	32.2	4.84	11.0
New Martinsville	70	— 5	37.2	6.69	8.5
Nuttallburg	65	4	35.0	4.94	5.0
Oceana	71	— 2	45.0	5.73	4.0
Parsons	74	— 5	36.3	8.33	2.0
Philippi	71	— 8	37.8	9.08	6.2
Pickens	65	— 6	36.0	11.54	6.0
Point Pleasant	74	— 2	40.3	6.96	5.0
Powellton	74	4	44.8	5.74	3.0
Princeton	64	— 2	40.0	5.85	4.0
Romney	69	3	34.6	4.34	6.0
Rowlesburg	......	......	......	10.07	10.0
Ryan	72	—11	40.4	7.66	4.6
Smithfield	......	......	......	8.13	6.5
Southside	72	— 5	40.2	8.44	3.5
Spencer	72	—12	37.0	6.69	5.0
Sutton	76	— 2	39.4	9.20	4.0
Terra Alta	64	—11	33.5	7.28	13.9
Union	65	4	39.0	3.34	2.0
Uppertract	70	— 7	37.8	2.51	4.0
Webster Springs	73	3	41.9	......	4.5
Wellsburg	65	— 6	32.4	6.33	21.5
Weston	72	— 2	37.8	8.41	5.5
Wheeling	77	2	40.0	4.22	8.0
Williamson	69	4	45.1	6.69	3.3
Wisconsin.					
Amherst	41	—25	12.4	2.10	17.5
Antigo	35	—26	10.4	0 44	4.5
Appleton	47	—17	16.4	2.05	14.5
Appleton Marsh	43	—24	12.2	1.73	11 7
Ashland	36	—26	8.0	1.12	13.2
Barron	36	—30	5.9	1.30	13.0
Beloit	49	— 3	24.0	2.77	5.5
Brodhead	48	—11	21.1	3.13	8.0
Burnett	45	—17	16.4	1.95	10.0
Butternut	35	—35	5.4	1.80	18.0
Chilton	48	—17	16.4	3.38	17.5
Chippewa Falls	......	......	......	1.35	13.0
Eau Claire	40	—25	10.4	1.85	13.5
Florence	33	—32	9.3	2.38	22.0
Fond du Lac	47	—19	17.2	2.27	11.6
Grand Rapids	40	—26	12.1	1.93	10.0
Grand River Locks	......	......	......	2.96	12.0
Grantsburg	36	—34	5.2	1.80	18.0
Hancock	44	—26	13.3	2.65	14.0
Hayward	36	—40	4.6	1.33	13.0
Hillsboro	47	—28	13.8	4.05	13.0
Koepenick	38	—34	11.4	2.00	17.0
Lake Mills	48	—13	19.0	2.73	8.1
Lancaster	......	......	......	1.25	7.0
Manitowoc	49	—12	18.6	2.04	11.2
Mauston	46	—24	15.6	2.19	11.5
Meadow Valley	41	—25	12.1	1.42	13.0
Medford	41	—26	11.0	0.70	7.0
Menasha	......	......	......	2.84	10.2
Merrill	34	—36	8.6	1.50	11.2
Minocqua	34	—33	7.5	0.72	7.0
Mount Horeb	48	—17	17.2	2.29	4.5
Neillsville	40	—28	9.4	2.15	12.0
New London	39	—20	14.5	2.51	18.0
New Richmond	43	—26	8.4	2.70	12.0
Oconto	46	—15	16.1	2.69	21.0
Osceola	39	—39	6.6	1.39	16.1
Oshkosh	45	—19	14.7	1.81	6.5
Pine River	44	—20	14.2	2.56	12.8
Portage	46	—18	16.8	1.75	9.0
Port Washington	50	— 7	18.8	3.00	12.5
Prairie du Chien	47	—14	18.1	1.89	7.0
Prentice	39	—37	6.1	1.46	5.8
Racine	49	— 8	24.0	2.99	......
Sheboygan	49	—10	20.4	2.77	17.5
Shullsburg	48	—12	20.4	2.82	3.0
Solon Springs	38	—37	4.2	1.65	16.5
Spooner	38	—32	5.6	1.31	13.2
Stanley	40	—30	8.8	2.02	12.2
Stevens Point	40	—27	9.2	2.58	14.0
Sturgeon Bay	41	—15	17.5	2.82	29.0
Valley Junction	41	—20	13.0	2.37	10.2
Viroqua	41	—16	14.3	1.83	10.0
Watertown	50	—15	18.0	2.83	11.0
Waukesha	......	......	......	2.15	6.8
Waupaca	44	—24	14.3	2.53	16.8
Wausau	38	—22	11.6	1.79	20.0
Weyerhauser	36	—34	7.8	1.05	12.0
Whitehall	41	—30	12.1	......	......
Wyoming.					
Afton	45	—16	18.4	1.40	19.5
Barnum	......	......	......	0.19	1.9
Barret Creek	50	— 5	22.0	2.58	35.0
Bedford	44	—19	17.6	2.91	29.1
Blue Cap	43	— 3	17.8	2.20	22 0
Border	45	—20	16.4	1.19	......
Buffalo	53	—28	15.3	0.20	2.0
Cheyenne	......	......	......	0.05	2.2
Chugwater	60	— 4	27.4	0.55	5.5
Wyoming—Cont'd.	°	°	°	*Ins.*	*Ins.*
Clark	53	—20	17.1	0.70	10.0
Clear Creek Cabin	49	—19	15.8	0.76	9.5
Cody	55	—22	14.0	6.85	8.5
Daniel	35	—30	8.7	2.05	20.5
Dubois	......	......	......	1.32	13.2
Elk Mountain	......	......	......	1.62	32.0
Embar	47	—15	15.9	0.50	5.0
Evanston	48	— 4	21.6	1.38	13.0
Fontenelle[f]	38	—17	13.1	......	......
Fort Laramie	60	—20	22.1	0.58	6.6
Fort Washakie	51	—16	20.6	0.40	4.0
Granite Canyon	53	0	26.8	0.52	5.5
Granite Springs	58	3	29.4	0.14	2.5
Green River	43	—11	18.8	0.35	10.0
Griggs	58	—19	19.1	0.20	2.0
Hatton	......	......	......	0.65	6.5
Hyattville	55	—20	17.4	......	......
Jackson	38	—29	14.2	1.86	......
Kirtley	57	—15	19.6	0.29	3.0
Laramie	52	— 6	24.7	0.29	5.0
Leo	44	—10	24.2	0.85	12.8
Little Medicine	40	—15	19.6	1.85	23.0
Lolabama Ranch	48	—23	16.8	1.50	15.0
Lusk	57	—15	19.5	0.40	4.0
Moorcroft	58	—24	14.8	0.50	5.0
Moore	56	— 5	28.2	0.36	6.0
New Castle	44	—16	16.0	1.15	11.5
Pathfinder	47	—13	24.7	0.24	7.5
Phillips	64	— 7	26.0	0.70	7.0
Pine Bluff	59	— 8	24.0	0.80	8.0
Pinedale	38	—21	11.4	0.94	12.5
Rawlins	45	— 2	22.0	0.39	8.8
Saratoga	69	3	28.0	0.75	12.0
Sheridan	54	—27	10.3	1.80	......
Shoshone Canyon	55	—17	17.9	0.82	11.0
South Pass City	60	—12	10.7	5.30	53.0
Wells	30	—40	8.6	2.52	29.0
Wheatland	57	—12	26.3	1.34	19.0
Wolf	60	—23	18.4	......	......
Wyncote	60	—18	22.7	0.63	6.3
Yellowstone Pk. (F'tain)	42	—15	15.4	......	......
Yellowstone Pk. (G'd Cn.)	36	—30	8.8	3.34	70.2
Yellowstone Pk. (Lake)	35	—18	13.6	4.09	72.0
Yellowstone Pk. (Norris)	42	—28	14.5	......	......
Yellowstone Pk (Riv'side)	39	—25	13.1	1.96	28.0
Yellowstone Pk (Snake R)	38	—26	11.8	3.05	40.0
Yellowstone Pk (Soda B)	38	—26	13.6	0.92	6.5
Porto Rico.					
Adjuntas	80	54	68.2	0.88	
Aguirre	93	57	75.0	0.19	
Aibonita	87	47	66.2	2.78	
Anasco	97	58	75.4	0.53	
Arecibo	83	50	68.8	3.29	
Barros	76	48	65.6	7.67	
Bayamon	82	54	70.2	4.39	
Caguas	88	51	68.6	3.00	
Canovanas	81	64	73.8	4.45	
Cayey	82	46	64.8	2.34	
Cidra	78	48	65.4	3.70	
Fajardo	88	60	77.0	2.48	
Guanica	89	53	71.6	0.05	
Guayama	......	......	......	0.02	
Hacienda Colosa	84	54	70.8	0.92	
Humacao	84	57	71.4	0.18	
Isabel	85	60	74.0	3.78	
Isolina	78	56	65.2	5.50	
Juana Diaz	90	61	75.4	0.00	
La Carmelita	83	55	69.2	0.48	
Lares	81	51	69.1	3.26	
Las Marias	86	58	70.4	0.63	
Manati	83	57	71.7	5.59	
Maunabo	86	62	75.4	1.98	
Mayaguez	89	55	73.1	0.26	
Ponce	89	57	73.8	0.09	
Rio Piedras	......	......	......	3.89	
San Lorenzo	85	48	68.0	1.41	
San Salvador	81	54	67.7	2.82	
Santa Isabel	87[f]	57[f]	73.2[f]	0.23	
Vieques	86	67	75.3	1.08	
Yabucoa	......	......	......	2.13	
Yauco	88	52	71.2	0.15	
New Brunswick.					
St. John	46	—17	15.2	4.17	24.6

CORRECTIONS.

December, 1906.

Arkansas, Princeton, make total precipitation 7.80.
California, Marysville, make total precipitation 9.63.
Colorado, Gothic, make mean temperature 21.2°.
New York, Arcade, make mean temperature 21.8°.
Oregon, Lakeview, make total precipitation 3.72; Mountain Park, make mean temperature 35.6°.
Tennessee, Springville, make mean temperature 43.4°.

October, 1906.

Wisconsin, Neillsville, make maximum temperature 80° and mean temperature 48.3°.

Late reports for December, 1906.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Alaska.	°	°	°	*Ins.*	*Ins.*
Chestochino	49	—35	—7.0	1.80	18.0
Circle City	20	—50	-25.2	0.75	9.5
Coal Harbor	46	12	30.2	2.87	2.2
Copper Center	40	—46	-16.6	0.35	6.0
Dutch Harbor	52	23	35.1	5.76	......
Fairbanks	30	—46	-16.7	1.15	11.5
Fort Egbert	34	—55	-15.8	0.07	1.0
Fort Gibbon	19	—48	-19.1	0.27	2.7
Fort Liscum	40	3	20.8	6.75	63.5
Juneau	48	2	30.3	......	75.0
Kenai	36	—26	10.5	1.16	10.0
Ketchemstock	13	—54	-23.2	0.20	3.0
Orca	47	12	26.2	8.56	39.0
Sunrise	38	—15	10.2	2.30	25.5
Teikhill	38	—31	—6.6	0.36	6.2
Wortmans	37	—17	7.7	2.90	29.0
Wood Island	44	14	30.6	3.20	3.5
Arizona.					
Keams Canon	......	......	......	2.99	3.0
Arkansas.					
Des Arc	......	......	......	7.09	0.5
California.					
Ozena	......	......	......	4.22	......
Sneddin	......	......	......	5.35	8.0
Summit	......	......	......	10.10	98.5
Georgia.					
Adairville	69[d]	16[d]	46.0[d]	5.22	
Michigan.					
Kalamazoo	......	......	......	2.56	9.0
Mississippi.					
Kosciusko	77	18	50.6	3.79	
Missouri.					
Decaturville	......	......	......	1.52	T.
Kidder	......	......	......	1.23	0.2
Lebanon	......	......	......	1.38	T.
Mount Vernon	......	......	......	1.06	3.0
Seymour	......	......	......	2.10	0.1
Montana.					
Belton.*	......	......	......	4.24	......
Twin Bridge	......	......	......	0.70	7.0
Warrick	......	......	......	1.45	14.5
Nebraska.					
McCook	......	......	......	0.50	0.5
New Jersey.					
Browns Mills	......	......	......	2.81	0.5
New York.					
Adams Center	48	—22	19.4	3.30	2.05
North Dakota.					
Moyersville	42	—27	7.5	......	......
Melville	......	......	......	0.90	9.0
Oregon.					
Buckeye Mine	45[f]	5[f]	26.0[f]	7.51	......
Newport	......	......	......	10.21	......
Sparta	45	9	33.1	2.95	24.0
South Carolina.					
Beaufort	75	24	52.1	2.16	
Washington.					
Rattlesnake	42[m]	13	28.8[g]	2.19	7.5
Stehekin	42	17	32.3	6.00	44.0
Wisconsin.					
Beloit	......	......	......	0.95	1.0
Porto Rico.					
Rio Blanco	85[e]	59[e]	73.2[e]	13.26	
San German[1]	90	57	75.4	......	

EXPLANATION OF SIGNS.

* Extremes of temperature from observed readings of dry thermometer.

A numeral following the name of a station indicates the hours of observation from which the mean temperature was obtained, thus:

[1] Mean of 7 a. m. + 2 p. m. + 9 p. m. + 9 p. m. ÷ 4.
[2] Mean of 8 a. m. + 8 p. m. ÷ 2.
[3] Mean of 7 a. m. + 7 p. m. ÷ 2.
[4] Mean of 6 a. m. + 6 p. m. ÷ 2.
[5] Mean of 7 a. m. + 2 p. m. ÷ 2.
[6] Mean of readings at various hours reduced to true daily mean by special tables.

The absence of a numeral indicates that the mean temperature has been obtained from daily readings of the maximum and minimum thermometers.

An italic letter following the name of a station, as "Livingston *a*," "Livingston *b*," indicates that two or more observers, as the case may be, are reporting from the same station. A small roman letter following the name of a station, or in figure columns, indicates the number of days missing from the record; for instance, "n" denotes 14 days missing.

No note is made of breaks in the continuity of temperature records when the same do not exceed two days. All known breaks of whatever duration, in the precipitation record receive appropriate notice.

TABLE III.—*Wind resultants, from observations at 8 a. m. and 8 p. m., daily, during the month of January, 1907.*

Stations.	Component direction from— N.	S.	E.	W.	Resultant. Direction from—	Duration.
New England.	*Hours.*	*Hours.*	*Hours.*	*Hours.*	°	*Hours.*
Eastport, Me	23	11	6	33	n. 66 w.	30
Portland, Me	31	8	3	34	n. 54 w.	39
Concord, N. H. †	17	4	7	9	n. 9 w.	13
Burlington, Vt. †	10	7	12	8	n. 53 e.	5
Northfield, Vt	27	27	10	10		
Boston, Mass	25	10	5	33	n. 62 w.	32
Nantucket, Mass	20	13	14	28	n. 63 w.	16
Block Island, R. I	26	14	12	27	n. 51 w.	19
Providence, R. I	28	7	8	32	n. 49 w.	32
Hartford, Conn	35	13	5	23	n. 39 w.	28
New Haven, Conn	34	9	11	22	n. 24 w.	27
Middle Atlantic States.						
Albany, N. Y	29	18	8	19	n. 45 w.	16
Binghamton, N. Y. †	11	5	13	9	n. 34 e.	7
New York, N. Y	23	11	12	29	n. 55 w.	21
Harrisburg, Pa	22	11	18	22	n. 20 w.	12
Philadelphia, Pa	29	15	15	18	n. 12 w.	14
Scranton, Pa	22	19	13	26	n. 77 w.	13
Atlantic City, N. J	30	13	10	23	n. 38 w.	22
Cape May, N. J	30	15	10	18	n. 28 w.	17
Baltimore, Md	25	14	13	22	n. 39 w.	14
Washington, D. C	25	16	18	11	n. 38 e.	11
Lynchburg, Va	13	24	21	20	s. 5 e.	11
Mount Weather, Va	16	24	16	24	s. 45 w.	11
Norfolk, Va	22	23	16	11	s. 79 e.	5
Richmond, Va	23	22	15	13	n. 63 e.	2
Wytheville, Va	15	8	9	40	n. 77 w.	32
South Atlantic States.						
Asheville, N. C	24	21	11	17	n. 63 w.	7
Charlotte, N. C	10	26	20	20	s.	16
Hatteras, N. C	25	15	20	19	n. 6 e.	10
Raleigh, N. C	15	22	12	25	s. 62 w.	15
Wilmington, N. C	25	20	11	21	n. 63 w.	11
Charleston, S. C	21	20	17	22	n. 79 w.	5
Columbia, S. C	17	14	21	22	n. 18 w.	3
Augusta, Ga	22	14	13	27	n. 60 w.	16
Savannah, Ga	14	16	16	25	s. 77 w.	9
Jacksonville, Fla	23	16	22	16	n. 41 e.	9
Florida Peninsula.						
Jupiter, Fla	13	14	36	11	s. 88 e.	25
Key West, Fla	29	5	42	2	n. 59 e.	47
Tampa, Fla	29	9	24	16	n. 22 e.	22
Eastern Gulf States.						
Atlanta, Ga	11	18	19	25	s. 41 w.	9
Macon, Ga. †	10	7	4	13	n. 72 w.	10
Thomasville, Ga	15	24	23	11	s. 53 e.	15
Pensacola, Fla. †	13	5	15	4	n. 54 e.	14
Anniston, Ala	14	33	17	8	s. 25 e.	21
Birmingham, Ala	14	•26	19	13	s. 37 e.	10
Mobile, Ala	23	23	25	5	e.	20
Montgomery, Ala	17	25	21	12	s. 48 e.	12
Meridian, Miss	17	27	15	12	s. 17 e.	10
Vicksburg, Miss	15	31	24	10	s. 41 e.	21
New Orleans, La	18	23	24	2	s. 77 e.	23
Western Gulf States.						
Shreveport, La	13	33	23	7	s. 39 e.	26
Bentonville, Ark. †	8	15	8	6	s. 16 e.	7
Fort Smith, Ark	9	17	30	14	s. 63 e.	18
Little Rock, Ark	18	27	18	11	s. 38 e.	11
Corpus Christi, Tex	19	27	30	0	s. 75 e.	31
Fort Worth, Tex	17	32	11	13	s. 8 w.	15
Galveston, Tex	15	24	37	2	s. 76 e.	36
Palestine, Tex	14	36	14	8	s. 15 e.	23
San Antonio, Tex	13	30	32	5	s. 57 e.	32
Taylor, Tex. †	8	15	8	3	s. 36 e.	9
Ohio Valley and Tennessee.						
Chattanooga, Tenn	15	33	14	14	s.	18
Knoxville, Tenn	20	20	8	30	w.	22
Memphis, Tenn	15	32	18	11	s. 22 e.	18
Nashville, Tenn	14	28	14	21	s. 27 w.	16
Lexington, Ky. †	6	15	7	11	s. 24 w.	10
Louisville, Ky	18	26	16	16	s.	8
Evansville, Ind. †	13	8	10	6	n. 39 e.	6
Indianapolis, Ind	19	25	17	21	s. 34 w.	7
Cincinnati, Ohio	17	16	23	20	n. 72 e.	3
Columbus, Ohio	17	19	19	22	s. 56 w.	4
Pittsburg, Pa	23	18	8	29	n. 77 w.	22
Parkersburg, W. Va	25	22	11	16	n. 59 w.	6
Elkins, W. Va	16	19	3	29	s. 83 w.	26
Lower Lake Region.						
Buffalo, N. Y	13	12	18	30	n. 85 w.	12
Canton, N. Y. †	11	6	10	13	n. 31 w.	6
Oswego, N. Y	15	27	12	19	s. 30 w.	14
Rochester, N. Y	6	20	13	34	s. 56 w.	25
Syracuse, N. Y	18	16	17	23	n. 72 w.	6
Erie, Pa	11	25	12	26	s. 45 w.	20
Cleveland, Ohio	11	26	17	21	s. 15 w.	15
Sandusky, Ohio †	4	10	7	16	s. 56 w.	11
Toledo, Ohio	16	18	15	28	s. 81 w.	13
Detroit, Mich	14	14	16	28	w.	12
Upper Lake Region.						
Alpena, Mich	17	14	11	30	n. 81 w.	19
Escanaba, Mich	24	9	11	32	n. 55 w.	26
Grand Haven, Mich	16	11	25	22	n. 31 e.	6
Grand Rapids, Mich	20	15	22	21	n. 11 e.	5
Houghton, Mich. †	10	4	9	15	n. 45 w.	8
Marquette, Mich	10	17	10	37	s. 75 w.	28
Port Huron, Mich	13	21	15	26	s. 54 w.	14
Sault Ste. Marie, Mich	14	18	33	12	s. 79 e.	21
Chicago, Ill	15	19	16	27	s. 70 w.	12
Milwaukee, Wis	18	13	11	29	n. 74 w.	19
Green Bay, Wis	19	13	13	28	n. 68 w.	16
Duluth, Minn	20	7	13	32	n. 56 w.	23

Stations.	Component direction from— N.	S.	E.	W.	Resultant. Direction from—	Duration.
North Dakota.	*Hours.*	*Hours.*	*Hours.*	*Hours.*	°	*Hours.*
Moorhead, Minn	26	16	11	21	n. 45 w.	14
Bismarck, N. Dak	25	14	18	20	n. 10 w.	11
Devils Lake, N. Dak	15	15	16	27	w.	11
Williston, N. Dak	22	14	15	20	n. 32 w.	9
Upper Mississippi Valley.						
Minneapolis, Minn.*	10	5	7	15	n. 58 w.	9
St. Paul, Minn	20	11	15	26	n. 51 w.	14
La Crosse, Wis. †	16	6	6	9	n. 17 w.	10
Madison, Wis	26	11	14	25	n. 36 w.	19
Charles City, Iowa	23	13	21	19	n. 11 e.	10
Davenport, Iowa	26	13	20	18	n. 9 e.	13
Des Moines, Iowa	25	15	21	18	n. 17 e.	10
Dubuque, Iowa	26	11	16	23	n. 25 w.	17
Keokuk, Iowa	26	16	14	18	n. 22 w.	11
Cairo, Ill	24	24	15	14	e.	1
La Salle, Ill. †	13	6	7	11	n. 30 w.	8
Peoria, Ill	23	21	14	19	n. 68 w.	5
Springfield, Ill	20	19	15	19	n. 76 w.	4
Hannibal, Mo. †	13	9	9	9	n.	4
St. Louis, Mo	23	21	20	10	n. 79 e.	10
Missouri Valley.						
Columbia, Mo.*	10	10	12	7	e.	5
Kansas City, Mo	22	19	21	14	n. 67 e.	8
Springfield, Mo	18	26	21	11	s. 51 e.	13
Iola, Kans. †	9	10	15	6	s. 84 e.	9
Topeka, Kans.*	10	9	12	8	n. 76 e.	4
Lincoln, Nebr	30	15	18	9	n. 31 e.	18
Omaha, Nebr	27	15	18	14	n. 18 e.	13
Valentine, Nebr	26	15	11	20	n. 39 w.	14
Sioux City, Iowa †	13	7	9	9	n.	6
Pierre, S. Dak	26	13	26	16	n. 38 e.	16
Huron, S. Dak	28	18	14	16	n. 11 w.	10
Yankton, S. Dak. †	5	6	8	8	s.	1
Northern Slope.						
Havre, Mont	18	4	23	27	n. 16 w.	15
Miles City, Mont	23	18	20	16	n. 39 e.	6
Helena, Mont	19	14	3	41	n. 83 w.	38
Kalispell, Mont	15	5	1	43	n. 77 w.	43
Rapid City, S. Dak	24	11	22	21	n. 4 e.	13
Cheyenne, Wyo	14	20	4	35	s. 79 w.	32
Lander, Wyo	16	24	20	16	s. 27 e.	9
Yellowstone Park, Wyo	13	40	3	19	s. 31 w.	31
North Platte, Nebr	19	20	22	17	s. 79 e.	5
Middle Slope.						
Denver, Colo	27	17	14	16	n. 11 w.	10
Pueblo, Colo	22	17	17	23	n. 50 w.	8
Concordia, Kans	23	19	15	8	n. 60 e.	8
Dodge, Kans	26	19	22	9	n. 65 e.	14
Wichita, Kans	26	20	23	8	n. 68 e.	16
Oklahoma, Okla	22	31	9	6	s. 18 e.	10
Southern Slope.						
Abilene, Tex	16	37	9	9	s.	21
Amarillo, Tex	12	37	15	10	s. 11 e.	26
Del Rio, Tex †	8	8	19	5	e.	14
Roswell, N. Mex	18	24	8	23	s. 68 w.	16
Southern Plateau.						
El Paso, Tex	25	2	9	41	n. 54 w.	39
Santa Fe, N. Mex	27	15	27	10	n. 55 e.	21
Flagstaff, Ariz	10	21	6	37	s. 70 w.	33
Phoenix, Ariz	7	12	28	22	s. 50 e.	8
Yuma, Ariz	31	9	18	13	n. 13 e.	23
Independence, Cal	26	22	9	17	n. 63 w.	9
Middle Plateau.						
Reno, Nev	9	26	17	17	s.	17
Tonopah, Nev	5	33	27	18	s. 18 e.	29
Winnemucca, Nev	17	17	21	26	w.	5
Modena, Utah	9	15	7	45	s. 81 w.	38
Salt Lake City, Utah	12	29	22	14	s. 25 e.	19
Durango, Colo	25	11	2	35	n. 67 w.	36
Grand Junction, Colo	19	15	15	28	n. 73 w.	14
Northern Plateau.						
Baker City, Oreg	13	33	12	16	s. 11 w.	20
Boise, Idaho	14	23	22	21	s. 6 e.	9
Lewiston, Idaho †	1	4	25	2	s. 83 e.	23
Pocatello, Idaho	4	35	21	17	s. 7 e.	31
Spokane, Wash	24	16	25	9	n. 63 e.	18
Walla Walla, Wash	4	41	6	22	s. 23 w.	40
North Pacific Coast Region.						
North Head, Wash	15	14	36	8	n. 88 e.	28
Port Crescent, Wash.*	7	10	18	4	s. 78 e.	14
Seattle, Wash	27	19	23	3	n. 68 e.	22
Tacoma, Wash	22	17	24	11	n. 69 e.	14
Tatoosh Island, Wash	5	9	43	6	s. 84 e.	37
Portland, Oreg	12	22	30	10	s. 63 e.	22
Roseburg, Oreg	17	25	13	18	s. 32 w.	9
Middle Pacific Coast Region.						
Eureka, Cal	9	38	12	15	s. 6 w.	29
Mount Tamalpais, Cal	14	26	21	20	s. 5 e.	12
Red Bluff, Cal	23	22	16	21	n. 79 w.	5
Sacramento, Cal	18	28	23	10	s. 52 e.	16
San Francisco, Cal	20	25	14	15	s. 11 w.	5
San Jose, Cal. †	4	16	11	11	s.	12
Southeast Farallon, Cal.*	6	15	10	8	s. 13 e.	9
South Pacific Coast Region.						
Fresno, Cal	17	16	26	15	n. 85 e.	11
Los Angeles, Cal	21	9	27	20	n. 30 e.	14
San Diego, Cal	26	10	13	24	n. 34 w.	19
San Luis Obispo, Cal	20	17	11	21	n. 73 w.	10
West Indies						
San Juan, Porto Rico	17	9	46	1	n. 80 e.	46
Grand Turk, W.I. †	5	4	27	0	n. 88 e.	27

* From observations at 8 p. m. only. † From observations at 8 a. m. only.

TABLE IV.—*Accumulated amounts of precipitation for each 5 minutes, for storms in which the rate of fall equaled or exceeded 0.25 in any 5 minutes, or 0.80 in 1 hour, during January, 1907, at all stations furnished with self-registering gages.*

Stations.	Date.	Total duration.		Total amount of precipitation.	Excessive rate.		Amount before excessive began.	Depths of precipitation (in inches) during periods of time indicated.													
		From—	To—		Began—	Ended—		5 min.	10 min.	15 min.	20 min.	25 min.	30 min.	35 min.	40 min.	45 min.	50 min.	60 min.	80 min.	100 min.	120 min.
	1	2	3	4	5	6	7														
Abilene, Tex	7-8			0.88														0.42			
Albany, N. Y	3			0.44														*			
Alpena, Mich	19-20			0.44														*			
Amarillo, Tex	8-9			0.85														*			
Anniston, Ala	19-20	10:25 p. m.	D. N.	0.63	11:55 p. m.	12:05 a. m.	0.16	0.22	0.32												
Asheville, N. C	20			0.13														0.12			
Atlanta, Ga	31-1†	7:05 p. m.	6:20 a. m.	0.93														0.27			
Atlantic City, N. J	16-18			1.02														*			
Augusta, Ga	25-26			0.30														0.12			
Baltimore, Md	15-17			0.96														*			
Bentonville, Ark	8	12:20 a. m.	8:05 a. m.	1.51	2:00 a. m.	2:45 a. m.	0.27	0.13	0.20	0.25	0.29	0.37	0.48	0.57	0.62	0.69					
Binghamton, N. Y	3-4			0.49														*			
Birmingham, Ala	19-20	9:19 p. m.	12:30 a. m.	0.90	10:39 p. m.	10:49 p. m.	0.17	0.29	0.43												
Bismarck, N. Dak	11			0.40														*			
Block Island, R. I	12			0.67														*			
Boise, Idaho	27-28			0.26														*			
Boston, Mass	25-27			0.84														*			
Buffalo, N. Y	3-4			1.55														*			
Cairo, Ill	1-3			4.81														*			
Canton, N. Y	3-4			0.88														*			
Charles City, Iowa	7			0.30														*			
Charleston, S. C	25-26			0.76														0.33			
Charlotte, N. C	31			0.22														0.07			
Chattanooga, Tenn	19-20			0.43														0.32			
Cheyenne, Wyo	1			0.35														*			
Chicago, Ill	18-19			1.83														*			
Cincinnati, Ohio	3-4			1.63														0.42			
Cleveland, Ohio	2-4			2.10														*			
Columbia, Mo	15			1.55														*			
Columbia, S. C	25-26			0.55														0.27			
Columbus, Ohio	3-4			1.39														*			
Concord, N. H	26			0.23														*			
Corpus Christi, Tex	3			0.20														0.17			
Davenport, Iowa	18-19			1.60														*			
Del Rio, Tex	8			0.03														0.01			
Denver, Colo	1			0.24														*			
Des Moines, Iowa	7			0.30														*			
Detroit, Mich	8			0.35														0.33			
Dodge, Kans	8			0.07														*			
Dubuque, Iowa	18-20			1.01														*			
Duluth, Minn	13			0.36														*			
Eastport, Me	11-12			1.39														*			
Elkins, W. Va	11-12			1.56														0.36			
Erie, Pa	2-4			1.69														*			
Escanaba, Mich	19-20			0.48														*			
Evansville, Ind	8	5:40 a. m.	1:00 p. m.	1.68	6:30 a. m.	7:15 a. m.	0.02	0.11	0.23	0.37	0.42	0.59	0.65	0.78	0.88	0.93					
Do	19	5:25 p. m.	8:30 p. m.	0.64	5:28 p. m.	5:31 p. m.	0.01	0.36													
Fort Smith, Ark	8-9			1.08														0.27			
Fort Worth, Tex	19			0.20														0.19			
Galveston, Tex	24-25			0.72														0.27			
Grand Haven, Mich	19			1.94														*			
Grand Rapids, Mich	18-22			2.15														*			
Green Bay, Wis	18-20			0.87														*			
Hannibal, Mo	18-19			2.41														0.44			
Harrisburg, Pa	12			0.70														0.17			
Hartford, Conn	12			0.42														*			
Hatteras, N. C	26			0.98														0.34			
Huron, S. Dak	1			0.54														*			
Indianapolis, Ind	2-4			2.55														*			
Iola, Kans	18-19	11:00 a. m.	9:15 a. m.	2.54	12:04 a. m	12:27 a. m.	0.95	0.06	0.20	0.39	0.52										
Jacksonville, Fla	25-26			0.08														0.05			
Jupiter, Fla	25	9.30 p. m.	10:30 p. m.	0.51	10:08 p. m.	10:23 p. m.	0.14	0.14	0.28	0.36											
Kansas City, Mo	18-19			2.21														*			
Key West, Fla	31			0.03														0.03			
Knoxville, Tenn	20			0.35														0.31			
La Crosse, Wis	7			0.53														*			
La Salle, Ill	18-19			2.10														*			
Lexington, Ky	11-12	1:30 p. m.	12:30 p. m.	1.46	5:47 a. m.	5:58 a. m.	0.23	0.19	0.32	0.35											
Lincoln, Nebr	1-2			0.27														*			
Little Rock, Ark	2-3	6:40 a. m.	1:15 p. m.	5.95	2:38 p. m.	3:03 p. m.	0.41	0.05	0.10	0.20	0.49	0.61									
					5:26 p. m.	6:09 p. m.	1.62	0.26	0.28	0.31	0.32	0.38	0.47	0.66	0.78	0.86					
					7:01 p. m.	7:44 p. m.	2.72	0.09	0.27	0.37	0.44	0.55	0.65	0.80	0.91	0.98					
Los Angeles, Cal	17			1.19														0.38			
Louisville, Ky	2	1:00 a. m.	2:50 p. m.	3.23	11:40 a. m.	12:00 m.	1.91	0.09	0.18	0.34	0.41										
Do	14	2:15 p. m.	7:27 p. m.	0.97	6:36 p. m.	6:41 p. m.	0.45	0.34													
Lynchburg, Va	31			0.30														0.11			
Macon, Ga	25-26			0.55														0.23			
Madison, Wis	18-20			1.04														0.26			
Marquette, Mich	11-14			0.58														*			
Memphis, Tenn	3			1.10														0.40			
Meridian, Miss	19	6:40 p. m.	8:30 p. m.	0.68	7:36 p. m.	8:00 p. m.	0.02	0.06	0.09	0.17	0.34	0.59									
Milwaukee, Wis	7			0.44														0.31			
Minneapolis, Minn	2			0.32														*			
Montgomery, Ala	20			0.64														0.53			
Mount Weather, Va	4			0.29														0.29			
Nantucket, Mass	26			1.26														0.41			
Nashville, Tenn	3			0.82														0.45			
New Haven, Conn	4			0.49														0.25			
New Orleans, La	25			0.90														0.41			
New York, N. Y	12			0.98														0.25			
Norfolk, Va	26			0.68														0.17			
Northfield, Vt	12			0.43														*			
North Head, Wash	2-3			1.57														0.19			
Oklahoma, Okla	8-9			0.82														0.21			
Omaha, Nebr	1			0.23														*			
Palestine, Tex	24-25			0.38														0.23			
Parkersburg, W. Va	8			1.25														0.64			
Pensacola, Fla	25	9:15 a. m.	9:05 p. m.	2.32	5:07 p. m.	5:57 p. m.	1.13	0.07	0.17	0.27	0.36	0.47	0.66	0.74	0.80	0.87	0.93				
Peoria, Ill	18-19			2.51														*			
Philadelphia, Pa	4			1.37														*			

TABLE IV.—*Accumulated amounts of precipitation for each 5 minutes, etc.*—Continued.

Stations.	Date.	Total duration. From—	Total duration. To—	Total amount of precipitation.	Excessive rate. Began—	Excessive rate. Ended—	Amount before excessive began.	5 min.	10 min.	15 min.	20 min.	25 min.	30 min.	35 min.	40 min.	45 min.	50 min.	60 min.	80 min.	100 min.	120 min.
	1	2	3	4	5	6	7														
Pittsburg, Pa.	12			0.97														*			
Portland, Me	19			0.38														0.11			
Portland, Oreg	2-4			3.43														0.25			
Pueblo, Colo.	26			0.13														*			
Raleigh, N. C	25-26			0.76														0.26			
Richmond, Va	26			0.38														0.10			
Rochester, N. Y.	3-4			1.04														*			
Sacramento, Cal.	31			0.47														0.17			
St. Louis, Mo	19			0.96														0.48			
St. Paul, Minn	28-29			0.24														0.07			
Salt Lake City, Utah	18			0.32														*			
San Antonio, Tex	24			0.24														0.19			
San Diego, Cal.	9-10			0.84														0.39			
Sandusky, Ohio	3-4			1.23														*			
San Francisco, Cal	4			0.50														0.29			
Savannah, Ga	25-26			0.38														0.28			
Scranton, Pa	8			0.56														0.39			
Seattle, Wash	2-3			1.20														0.27			
Shreveport, La	1			0.60														0.29			
Spokane, Wash.	2-3			1.11														*			
Springfield, Ill	18	1:14 p. m.	10:00 p. m.	1.72	7:23 p. m.	7:35 p. m.	0.88	0.16	0.29	0.37											
Springfield, Mo.	8-9			1.74														*			
Syracuse, N. Y.	3-4			0.97														*			
Tampa, Fla	25			0.45														0.26			
Taylor, Tex.	19			0.13														0.13			
Thomasville, Ga.	20			0.31														0.27			
Toledo, Ohio	2-4			1.32														*			
Topeka, Kans	18-19			1.38														*			
Valentine, Nebr.	1			0.16														*			
Vicksburg, Miss	3	3:15 p. m.	7:20 p. m.	0.63	3:26 p. m.	3:41 p. m.	0.04	0.09	0.28	0.47											
Washington, D. C	4			0.25														0.25			
Wichita, Kans	18-19	9:40 p. m.	D. N. 19th.	1.51	10:04 p. m.	10:33 p. m.	0.05	0.17	0.29	0.40	0.60	0.65	0.76								
Wilmington, N. C	26			0.82														0.28			
Wytheville, Va.	4			0.18														0.12			
Yankton, S. Dak	27-29			0.39														*			
San Juan, Porto Rico	20			1.05														0.46			

*Self-register not working † Of February.

TABLE V.—*Data furnished by the Canadian Meteorological Service, January, 1907.*

Stations.	Pressure, in inches. Actual, reduced to mean of 24 hours.	Pressure. Sea level, reduced to mean of 24 hours.	Pressure. Departure from normal.	Temperature. Mean.	Temperature. Departure from normal.	Temperature. Mean maximum.	Temperature. Mean minimum.	Precipitation. Total.	Precipitation. Departure from normal.	Precipitation. Total snowfall.
	Ins.	Ins.	Ins.	°	°	°	°	Ins.	Ins.	Ins.
St. Johns, N. F	29.80	29.95	+.09	23.2	− 0.6	31.0	15.4	5.49	−0.42	12.6
Sydney, C. B. I.	30.06	30.10	+.17	20.9	+ 0.4	31.6	10.2	5.06	−0.04	28.2
Halifax, N. S.	30.04	30.15	+.18	21.7	− 0.1	30.9	12.5	6.18	+0.41	25.0
Grand Manan, N. B	30.07	30.13	+.14	21.2	− 2.2	30.4	12.0	4.52	−0.39	28.5
Yarmouth, N. S	30.08	30.16	+.16	23.1	− 3.2	31.9	14.3	3.99	−1.42	13.0
Charlottetown, P. E. I	30.07	30.11	+.15	15.4	− 1.6	23.8	7.1	3.33	−0.63	20.6
Chatham, N. B	30.09	30.12	+.15	9.2	− 0.6	20.6	− 2.2	3.85	+0.26	25.2
Father Point, Que.	30.12	30.15	+.17	5.6	− 2.4	14.2	− 3.0	2.02	−0.83	19.6
Quebec, Que	29.84	30.19	+.17	6.3	− 2.8	14.0	− 1.5	2.68	−1.33	23.4
Montreal, Que	29.98	30.21	+.17	10.7	− 1.0	18.0	3.3	3.35	−0.38	23.0
Rockliffe, Ont.	29.57	30.22	+.20	3.8	− 2.6	15.8	− 8.2	1.24	−1.08	10.4
Ottawa, Ont	29.84	30.19	+.16	10.6	+ 1.0	18.4	2.9	1.89	−1.10	14.5
Kingston, Ont.	29.89	30.23	+.18	16.4	− 0.7	23.8	8.9	1.96	−1.49	6.7
Toronto, Ont	29.79	30.19	+.14	22.1	+ 3.7	28.6	15.7	4.12	+1.20	18.0
White River, Ont	28.70	30.11	+.10	−4.2	− 8.8	9.3	−17.7	2.26	+0.57	22.6
Port Stanley, Ont	29.52	30.19	+.12	23.5	+ 1.3	30.7	16.3	4.39	+1.40	17.4
Saugeen, Ont	29.43	30.17	+.14	21.6	+ 1.2	28.8	14.3	3.70	−0.35	28.7
Parry Sound, Ont	29.44	30.19	+.18	14.1	+ 0.3	22.9	5.3	3.34	−0.74	22.5
Port Arthur, Ont.	29.44	30.21	+.14	2.4	− 0.7	11.3	− 6.6	1.03	+0.21	10.3
Winnipeg, Man	29.35	30.27	+.16	−11.4	− 4.6	− 1.1	−21.6	2.12	+1.24	21.2
Minnedosa, Man	28.25	30.22	+.12	−11.0	− 3.8	− 1.3	−20.6	1.23	+0.43	12.3
Qu'Appelle, Sask	27.77	30.22	+.14	−12.1	− 8.3	− 2.4	−21.9	0.28	−0.22	2.8
Medicine Hat, Alberta.	27.76	30.22	+.15	− 8.1	−13.6	1.0	−17.2	0.75	+0.18	7.5
Swift Current, Sask.	27.46	30.26	+.17	− 8.6	−11.7	0.4	−17.6	1.02	+0.38	10.2
Calgary, Alberta	26.39	30.24	+.21	− 6.3	−14.7	3.0	−15.5	0.40	−0.13	4.0
Banff, Alberta	25.27	30.21	+.21	− 4.2	−16.3	7.4	−15.9	1.64	+0.45	16.4
Edmonton, Alberta	27.76	30.26	+.23	−12.3	−14.1	− 1.3	−23.3	1.04	+0.36	10.4
Prince Albert, Sask.										
Battleford, Sask	28.36	30.27	+.19	−17.7	−11.8	− 8.3	−27.1	0.13	−0.27	1.3
Kamloops, B. C.	28.92	30.22	+.26	3.7	−19.3	11.8	− 4.4	1.10	+0.28	11.0
Victoria, B. C.	29.88	29.98	+.61	33.3	− 5.2	37.6	28.9	3.13	−2.26	4.9
Barkerville, B. C.										
Hamilton, Bermuda	30.09	30.26	+.13	64.5	+ 2.5	69.1	60.0	1.48	−3.46	
Dawson, Yukon										

TABLE VI.—*Heights of rivers referred to zeros of gages, January, 1907.*

Stations.	Distance to mouth of river.	Flood stage on gage.	Highest water. Height.	Highest water. Date.	Lowest water. Height.	Lowest water. Date.	Mean stage.	Monthly range.
	Miles.	Feet.	Feet.		Feet.		Feet.	Feet.
Milk River.								
Havre, Mont. (31)	237	9						
James River.								
Huron, S. Dak. (31)	139	9						
Big Blue River								
Beatrice, Nebr. (10)	92	14	2.8	3	2.3	24-26	2.5	0.5
Blue Rapids, Kans. (16)	47	14	3.8	23, 24	3.7	1-14	3.7	0.1
Republican River.								
Clay Center, Kans. (6)	42	18	6.6	2-6	5.2	16, 17	5.9	1.4
Solomon River.								
Beloit, Kans	75	16	1.7	1,5	0.6	{6,8-10, 12,13,15-20,24-28, 30, 31}	0.8	1.1
Smoky Hill-Kansas River.								
Lindsborg, Kans.	341	20	4.6	22	1.5	8, 16	2.0	3.1
Abilene, Kans.	277	22	3.9	21	0.5	1, 2, 14	0.9	3.4
Smoky Hill-Kans. Riv.-Con.								
Manhattan, Kans	116	18	4.9	20	2.6	15-19	3.5	2.3
Topeka, Kans	87	21	6.8	20, 21	6.1	1, 16	6.4	0.7
Missouri River.								
Bismarck, N. Dak.	1,309	14	3.2	11-13	1.4	1, 31	2.3	1.8
Pierre, S. Dak. (31)	1,114	14						
Sioux City, Iowa	784	17	9.5	26,27,29,30	7.0	3	8.4	2.5
Blair, Nebr.	705	15	11.3	8	8.4	1	9.5	2.9
Omaha, Nebr. (31)	669	18						
St. Joseph, Mo	481	10	2.3	6, 7	−1.3	28	0.5	3.6
Kansas City, Mo.	388	21	8.9	21	3.8	29	6.3	5.1
Glasgow, Mo.	231	18	10.3	22	3.1	1	5.5	7.2
Boonville, Mo.	199	20	17.5	22	8.2	1	10.9	9.3
Hermann, Mo.	103	24	18.3	20	5.4	1	10.7	12.9
Minnesota River.								
Mankato, Minn	127	18	3.6	1-3	2.8	30, 31	3.2	0.8

TABLE VI.—*Heights of rivers referred to zeros of gages*—Continued.

Stations.	Distance to mouth of river.	Flood stage on gage.	Highest water. Height.	Highest water. Date.	Lowest water. Height.	Lowest water. Date.	Mean stage.	Monthly range.
Red Cedar River.	*Miles.*	*Feet.*	*Feet.*		*Feet.*		*Feet.*	*Feet.*
Cedar Rapids, Iowa	77	14	6.2	21	3.6	19	4.7	2.6
Des Moines River.								
Des Moines, Iowa (6)	205	19	2.5	1-5	2.3	10-25	2.4	0.2
Illinois River.								
La Salle, Ill	197	18	28.6	21	16.5	1	21.2	12.1
Peoria, Ill.	135	14	20.4	24, 25	11.6	1	15.7	8.8
Beardstown, Ill.	23	11	18.3	29, 30	10.4	1-6	13.3	7.9
Clarion River.								
Clarion, Pa.	32	10	7.0	9, 20	2.8	30, 31	4.3	4.2
Conemaugh River.								
Johnstown, Pa.	64	7	11.0	14	2.8	30, 31	4.3	8.2
Allegheny River								
Warren, Pa	177	14	7.2	9	1.7	30, 31	4.1	5.5
Franklin, Pa	114	15	9.1	9	2.4	31	5.6	6.7
Parker, Pa. (6)	73	20	9.5	9	4.2	19	6.7	5.3
Freeport, Pa.	29	20	17.7	20	5.7	31	11.1	12.0
Springdale, Pa.	17	27	22.3	20	9.7	29, 31	15.1	12.6
Cheat River.								
Rowlesburg, W. Va. (4)	36	14	10.0	18	2.5	7	4.8	7.5
Youghiogheny River.								
Confluence, Pa.	59	10	13.4	19	1.8	28-31	4.6	11.6
West Newton, Pa.	15	23	15.5	19	1.5	30	6.4	14.0
Monongahela River.								
Weston, W. Va.	161	18	12.0	9	0.2	8	2.4	11.8
Fairmont, W. Va.	119	25	30.7	17	15.3	29-31	18.5	15.4
Greensboro, Pa. (1)	81	18	31.0	18	7.9	29-31	12.9	23.1
Lock No. 4, Pa.	40	28	36.6	18	8.1	29-31	16.0	28.5
Beaver River.								
Ellwood Junction, Pa. (8)	10	14	8.4	20	1.6	3	4.0	6.8
Muskingum River.								
Zanesville, Ohio	70	25	25.3	21	10.4	31	17.2	14.9
Beverly, Ohio	20	25	23.3	21, 22	8.6	29, 31	15.6	14.7
Little Kanawha River.								
Glenville, W. Va	77	20	21.2	9	0.8	29	5.7	20.4
Creston, W. Va. (a)	38	20	22.0	13	3.0	31	8.7	19.0
New-Great Kanawha River.								
Radford, Va	213	14	3.9	3	1.6	31	2.5	2.3
Hinton, W. Va.	153	14	7.5	17, 18	2.5	30, 31	4.0	5.0
Charleston, W. Va.	58	30	29.3	18	4.6	31	10.5	24.7
Scioto River.								
Columbus, Ohio.	110	17	18.8	4	3.5	29, 31	7.9	15.3
Licking River.								
Falmouth, Ky.	30	25	28.5	17	3.0	31	12.3	25.5
Miami River.								
Dayton, Ohio	77	18	12.0	20	3.0	31	6.0	9.0
Kentucky River.								
Jackson, Ky	287	24	21.2	18	5.4	13, 14	8.0	15.8
Beattyville, Ky	254	30	28.5	20	1.4	21	5.6	27.1
High Bridge, Ky	117	17	25.7	21	10.5	31	15.3	15.2
Frankfort, Ky.	65	31	29.6	21	7.1	30, 31	12.9	22.5
Wabash River.								
Terre Haute, Ind	171	16	24.7	23	7.9	1	16.7	16.8
Mount Carmel, Ill.	75	15	24.5	28	10.3	1	21.5	14.2
Cumberland River.								
Burnside, Ky.	518	50	30.5	19	3.5	31	10.8	27.0
Celina, Tenn.	383	45	31.5	1	6.1	31	15.2	25.4
Carthage, Tenn.	308	40	33.2	2	5.3	31	14.4	27.9
Nashville, Tenn	193	40	35.5	4	11.1	31	20.7	24.4
Clarksville, Tenn.	126	42	42.0	5	14.1	18	26.1	27.9
Powell River.								
Tazewell, Tenn.	44	20	8.0	20	1.0	16-18	2.4	7.0
Clinch River.								
Speers Ferry, Va.	156	20	5.5	19	0.5	15, 16, 31	1.6	5.0
Clinton, Tenn	52	25	15.5	1	5.4	17	8.1	10.1
South Fork Holston River.								
Bluff City, Tenn.	35	15	3.3	1	1.3	31	2.0	2.0
Holston River.								
Mendota, Va	165	8	4.4	19	1.3	14-16	2.0	3.1
Rogersville, Tenn.	103	14	5.0	1	2.3	31	3.1	2.7
French Broad River.								
Asheville, N. C.	144	6	2.8	1	0.1	24-26,28-31	0.5	2.7
Dandridge, Tenn.	46	12	4.3	1	1.4	29-31	2.0	2.9
Little Tennessee River.								
McGhee, Tenn	17	20	7.5	1	3.7	30	4.5	3.8
Hiwassee River.								
Charleston, Tenn	18	22	10.5	1	2.4	29-31	3.6	8.1
Tennessee River.								
Knoxville, Tenn.	635	12	7.9	1	2.0	31	3.5	5.9
Loudon, Tenn	590	25	8.5	1	2.4	31	3.7	6.1
Kingston, Tenn	556	25	11.9	1	3.0	20	4.7	8.9
Chattanooga, Tenn.	452	33	20.5	1	5.1	19, 20, 31	7.9	15.4
Bridgeport, Ala	402	24	16.3	2	3.4	31	6.0	12.9
Guntersville, Ala.	349	31	23.2	3	6.5	18,19,30,31	10.4	16.7
Florence, Ala.	255	16	14.0	3,4	3.7	31	6.7	10.3
Riverton, Ala.	225	26	23.3	4	6.4	31	11.1	16.9
Johnsonville, Tenn.	95	21	24.1	6	9.1	19	14.6	15.0
Ohio River.								
Pittsburg, Pa.	966	22	23.2	20	3.7	31	12.4	19.5
Dam No. 2, Pa.	956	25	23.4	20	5.4	29-31	12.7	18.0
Beaver Dam, Pa	925	27	33.7	20	8.2	30	18.9	25.5
Wheeling, W. Va.	875	36	36.9	20	7.6	31	20.2	29.3
Parkersburg, W. Va	785	36	40.1	21	8.5	31	25.1	31.6
Point Pleasant, W. Va.	703	39	50.2	19	10.3	31	31.3	39.9
Huntington, W. Va	660	50	58.0	19	14.5	31	36.2	43.5
Catlettsburg, Ky.	651	50	60.0	19, 20	14.0	31	37.4	46.0
Portsmouth, Ohio	612	50	61.0	20	16.0	31	40.0	45.0
Maysville, Ky.	559	50	60.3	21	17.2	31	40.4	43.1
Cincinnati, Ohio.	499	50	65.2	21	22.0	31	45.7	43.2
Madison, Ind	413	46	56.7	22	22.1	31	40.5	34.6
Louisville, Ky.	367	28	41.4	22	9.2	31	24.3	32.2
Evansville, Ind.	184	35	46.2	24, 25	21.7	1	40.2	24.5
Mount Vernon, Ind	148	35	48.7	27	20.9	1	40.8	27.8

Stations.	Distance to mouth of river.	Flood stage on gage.	Highest water. Height.	Highest water. Date.	Lowest water. Height.	Lowest water. Date.	Mean stage.	Monthly range.
Ohio River—Cont'd.	*Miles.*	*Feet.*	*Feet.*		*Feet.*		*Feet.*	*Feet.*
Paducah, Ky.	47	40	45.7	28	23.8	1	38.8	21.9
Cairo, Ill.	1	45	50.4	27	27.5	1	42.8	22.9
St. Francis River.								
Marked Tree, Ark.	104	17	19.8	9-12	17.6	1	19.1	2.2
Neosho River.								
Neosho Rapids, Kans.	326	22	18.4	21	0.9	5, 6	3.3	17.5
Iola, Kans	262	10	13.4	20	0.3	1-15	2.4	13.1
Oswego, Kans.	184	20	21.0	25	0.8	5-8	7.1	20.2
Fort Gibson, Ind. T	3	22	22.0	23	8.3	2, 3	13.9	13.7
Canadian River.								
Calvin, Ind. T	99	10	5.0	8	2.5	31	3.3	2.5
Black River.								
Blackrock, Ark	67	12	26.0	4	16.0	31	21.4	10.0
White River.								
Calicorock, Ark	272	15	17.5	11	4.6	2	8.5	12.9
Batesville, Ark	217	18	20.5	11	6.8	31	11.7	13.7
Newport, Ark	185	26	28.5	14	18.4	1	24.1	10.1
Clarendon, Ark	75	30	32.5	9-11	28.6	1, 2	31.0	3.9
Arkansas River.								
Wichita, Kans	832	10	2.7	20	0.0	13	1.0	2.7
Tulsa, Ind. T	551	16	12.4	22	3.7	1-8	5.5	8.7
Webbers Falls, Ind. T	465	23	19.4	23	5.0	1-5	10.2	14.4
Fort Smith, Ark	403	22	18.6	24	4.1	1-5	10.9	14.5
Dardanelle, Ark	256	21	17.6	24	5.0	2	11.1	12.6
Little Rock, Ark	176	23	19.0	25	9.0	1	14.1	10.0
Pine Bluff, Ark	121	23	21.0	26	9.9	1	16.5	11.1
Yazoo River.								
Greenwood, Miss	175		29.4	1	23.5	31	26.9	5.9
Yazoo City, Miss	80	25	24.3	31	21.9	9-11	22.6	2.4
Ouachita River.								
Camden, Ark	304	39	42.0	6	10.0	31	23.6	32.0
Monroe, La	122	40	38.5	23-26	29.3	1	34.7	9.2
Red River								
Denison, Tex	768	22	5.2	14, 23	1.7	1	3.2	3.5
Arthur City, Tex	688	27	12.4	15	7.5	1	9.9	4.9
Fulton, Ark	515	28	22.0	7	12.5	1	17.4	9.5
Shreveport, La	327	29	16.2	9, 10	8.1	2	13.1	8.1
Alexandria, La	118	33	23.0	14, 15	13.1	5	19.4	9.9
Mississippi River.								
Fort Ripley, Minn. (26)	2,082	10	......	......	......	......	......	......
St. Paul, Minn. (31)	1,954	14	......	......	......	......	......	......
Reeds Landing, Minn. (31)	1,884	12	......	......	......	......	......	......
La Crosse, Wis. (31)	1,819	12	......	......	......	......	......	......
Prairie du Chien, Wis. (31)	1,759	18	......	......	......	......	......	......
Dubuque, Iowa (31)	1,699	18	......	......	......	......	......	......
Leclaire, Iowa (23)	1,609	10	......	......	......	......	......	......
Davenport, Iowa	1,593	15	8.1	22, 23	4.1	17, 18	5.7	4.0
Muscatine, Iowa	1,562	16	9.7	24	5.6	1	7.6	4.1
Galland, Iowa	1,472	8	6.0	23, 24	2.0	1	4.0	4.0
Keokuk, Iowa.	1,463	15	9.3	21	3.4	1	5.9	5.9
Warsaw, Ill.	1,458	18	12.1	21	6.5	1	8.8	5.6
Hannibal, Mo	1,402	13	11.4	22	3.5	1	7.0	7.9
Grafton, Ill	1,306	23	18.1	23	6.4	1	10.8	11.7
St. Louis, Mo	1,264	30	26.3	23	5.1	1	14.9	21.2
Chester, Ill	1,189	30	23.2	24	4.7	1	13.5	18.5
Cape Girardeau, Mo.	1,128	28	29.0	25	9.4	1, 2	19.6	19.6
New Madrid, Mo.	1,003	34	39.3	28, 29	22.4	1	33.7	16.9
Luxora, Ark	905	33	34.7	31	16.2	2	27.2	18.5
Memphis, Tenn	843	33	39.0	31	21.1	3	31.5	17.9
Helena, Ark.	767	42	47.7	31	30.8	3, 4	40.7	16.9
Arkansas City, Ark.	635	42	50.0	31	37.1	4	44.5	12.9
Greenville, Miss.	595	42	44.6	31	32.1	4, 5	38.9	12.5
Vicksburg, Miss.	474	45	47.0	31	36.0	6	41.4	11.0
Natchez, Miss.	373	46	45.6	31	36.0	1	40.4	9.6
Baton Rouge, La.	240	35	33.7	31	26.7	10	29.6	7.0
Donaldsonville, La	188	28	27.1	31	21.5	1	23.8	5.6
New Orleans, La.	108	16	18.2	31	14.7	1, 3, 8	16.2	3.5
Atchafalaya River.								
Simmesport, La.	127	33	37.2	31	30.3	1	33.3	6.9
Melville, La.	103	31	35.0	31	30.8	1	32.5	4.2
Morgan City, La	19	8	4.5	17, 19	2.8	21	3.7	1.7
Grand River.								
Grand Rapids, Mich.	38	11	18.5	24	2.7	1	7.7	15.8
Sandusky River.								
Tiffin, Ohio (4)	65	7	6.5	6, 20, 21	0.8	27	3.5	5.7
Penobscot River.								
Mattawamkeag, Me. (31)	87	......	......	......	......	......	......	......
West Enfield, Me. (31)	60	......	......	......	......	......	......	......
Kennebec River.								
Winslow, Me	46	8	5.5	3	4.0	20	4.8	1.5
Merrimac River.								
Franklin Junction, N. H (*)	110	13	5.2	5, 7, 27, 29	4.1	13	4.9	1.1
Concord, N. H. (31)	94	10	......	......	......	......	......	......
Manchester, N. H	68	8	4.3	6	2.3	18, 30, 31	3.1	2.0
Connecticut River.								
Wells River, Vt. (31)	255	34	......	......	......	......	......	......
Whiteriver Junction, Vt (31)	209	......	......	......	......	......	......	......
Bellows Falls, Vt	170	12	4.3	13	1.9	19	2.7	2.4
Holyoke, Mass	84	9	4.9	6	0.9	19	3.3	4.0
Hartford, Conn. (14)	50	16	7.6	2	3.7	16	6.1	3.9
Housatonic River.								
Gaylordsville, Conn	44	15	6.1	2	4.2	17, 31	5.0	1.9
Mohawk River.								
Utica, N. Y.	98	6	11.5	4, 5	2.2	18, 19	5.4	9.3
Tribeshill, N. Y.	42	12	7.2	5	1.2	26-31	2.8	6.0
Schenectady, N. Y.	19	15	10.8	4	1.5	26-31	3.5	9.3
Hudson River.								
Glens Falls, N. Y	197	20	5.8	7, 8	3.7	18	4.6	2.1
Troy, N. Y.	154	14	15.9	4	3.5	1	6.9	12.4
Albany, N. Y.	147	12	11.4	5	3.2	19	5.6	8.2
Stuyvesant, N. Y.	128	9	5.5	7	1.0	17, 26	2.8	4.5

TABLE VI.—*Heights of rivers referred to zeros of gages*—Continued.

Stations.	Distance to mouth of river.	Flood stage on gage.	Highest water.		Lowest water.		Mean stage.	Monthly range.
			Height.	Date.	Height.	Date.		
	Miles.	*Feet.*	*Feet.*		*Feet.*		*Feet.*	*Feet.*
Pompton River.								
Pompton Plains, N. J.	6	8	5.8	1	4.3	28-31	4.7	1.5
Passaic River.								
Chatham, N. J. (9)	69	7	5.5	21	2.9	12	4.2	2.6
Lehigh River.								
Mauch Chunk, Pa (11)	45	15	7.8	1	5.1	13, 17, 22	5.5	2.7
Schuylkill River.								
Reading, Pa.	66	12	7.9	1	0.9	31	2.0	7.0
Delaware River.								
Hancock (E. Branch), N. Y.	287	12	8.3	25	3.7	18	5.4	4.6
Hancock (W. Branch), N. Y.	287	10	6.7	1	3.2	25	4.6	3.5
Port Jervis, N. Y.	215	14	7.2	1	1.6	30	3.1	5.6
Phillipsburg, N. J. (12)	146	26	11.6	1	4.3	20	5.9	7.3
Trenton, N. J.	92	18	8.8	26, 27	2.8	22-24	4.9	6.0
North Branch Susquehanna.								
Binghamton, N. Y.	183	16	9.8	5	3.0	18, 23-27, 30	5.0	6.8
Towanda, Pa	139	16	12.5	1	3.0	26, 27	5.2	9.5
Wilkes-Barre, Pa.	60	17	15.4	2	6.6	19	10.8	8.8
West Branch Susquehanna.								
Clearfield, Pa.	165	8	5.7	20	1.4	29-31	2.8	4.3
Renovo, Pa.	90	16	10.0	21	2.0	31	5.0	8.0
Williamsport, Pa.	39	20	11.2	21	3.3	30	6.4	7.9
Juniata River.								
Huntingdon, Pa.	90	24	7.2	15	4.1	31	5.2	3.1
Susquehanna River.								
Selinsgrove, Pa.	116	17	8.0	2, 22	2.2	31	4.9	5.8
Harrisburg, Pa.	69	17	9.9	2	3.1	29, 31	6.3	6.8
Shenandoah River.								
Riverton, Va.	58	22	1.6	20	— 0.5	1-13	0.0	2.1
Potomac River.								
Cumberland, Md.	290	8	8.0	19	3.9	7	5.8	4.1
Harpers Ferry, W. Va.	172	18	12.5	21	2.8	31	6.6	9.7
James River.								
Buchanan, Va.	305	12	7.5	19	3.2	30, 31	4.6	4.3
Lynchburg, Va.	260	18	5.3	19	1.6	30, 31	3.0	3.7
Columbia, Va.	167	18	9.9	19	4.9	31	6.8	5.0
Richmond, Va.	111	12	2.6	3	0.5	13, 27	1.2	2.1
Dan River.								
Danville, Va.	55	8	4.4	1	— 0.1	29-31	0.3	4.5
Staunton River.								
Randolph, Va.	26	28	8.4	1	5.4	20, 24, 30, 31	5.9	3.0
Roanoke River.								
Clarksville, Va	196	12	3.5	2	0.5	25	1.2	3.0
Weldon, N. C.	129	30	21.2	3	10.4	31	11.5	10.8
Tar River.								
Tarboro, N. C.	46	25	4.6	3	2.6	26	3.5	2.0
Greenville, N. C.	21	22	6.5	3	3.8	23	4.8	2.7
Haw River.								
Moncure, N. C.	171	25	8.8	2	8.3	12-31	8.4	0.5
Cape Fear River.								
Fayetteville, N. C.	112	38	7.0	3	3.6	25	4.6	3.4
Waccamaw River.								
Conway, S. C.	40	7	3.2	1, 4	1.6	24, 25, 28, 29	2.4	1.6
Pedee River.								
Cheraw, S. C.	149	27	16.1	2	2.6	26, 31	4.3	13.5
Smiths Mills, S. C.	51	16	11.2	9-11	5.5	27-31	7.8	5.7
Lynch Creek.								
Effingham, S. C.	35	12	6.8	7	4.0	27-29	5.2	2.8
Black River.								
Kingstree, S. C.	45	12	9.0	4, 5	4.3	30, 31	6.3	4.7
Catawba-Wateree River.								
Mount Holly, N. C.	143	15	6.0	1	1.8	23-31	2.2	4.2
Catawba, S. C.	107	11	8.0	2	2.0	29, 31	3.0	6.0
Camden, S. C.	37	24	19.8	2	4.3	28	8.4	15.5
Broad River.								
Blairs, S. C.	36	14	8.2	2	1.1	31	2.7	7.1
Saluda River.								
Pelzer, S. C.	109	7	4.5	1-4	3.3	13-19, 21-23	3.7	1.2
Chappels, S. C.	56	14	13.0	3	3.0	16, 25, 30	5.2	10.0
Congaree River.								
Columbia, S. C.	52	15	7.5	2	1.0	14, 20, 21	1.9	6.5
Santee River.								
Rimini, S. C.	108	12	13.2	6	7.3	30	9.7	5.9
St. Stephens, S. C.	50	10	9.0	13	5.3	29	7.4	3.7
Edisto River.								
Edisto, S. C.	75	6	4.2	2, 5-7	2.5	26-28	3.3	1.7
Broad River.								
Carlton, Ga.	30	11	6.7	1	2.5	24-30	3.1	4.2
Savannah River.								
Calhoun Falls, S. C.	347	15	3.9	1	2.8	23-25	3.1	1.1
Augusta, Ga.	268	32	20.6	2	9.0	26	10.3	11.6
Oconee River.								
Milledgeville, Ga.	147	25	8.0	2	3.2	25	4.0	4.8
Dublin, Ga	79	30	6.5	5	1.1	25	2.5	5.4
Ocmulgee River.								
Macon, Ga.	203	18	10.8	1	3.0	25, 30	4.1	7.8
Abbeville, Ga.	96	11	8.8	8	3.8	26, 27	5.4	5.0

Stations.	Distance to mouth of river.	Flood stage on gage.	Highest water.		Lowest water.		Mean stage.	Monthly range.
			Height.	Date.	Height.	Date.		
	Miles.	*Feet.*	*Feet.*		*Feet.*		*Feet.*	*Feet.*
Flint River.								
Woodbury, Ga.	227	10	2.5	1	0.8	18, 19, 24, 25, 29, 30	1.1	1.7
Montezuma, Ga.	152	20	10.0	3	3.0	19, 20	5.1	7.0
Albany, Ga.	90	20	7.8	6	2.2	22, 23	3.7	5.6
Bainbridge, Ga.	29	22	8.1	7	4.3	21, 23, 24	5.4	3.8
Chattahoochee River.								
Oakdale, Ga	305	18	15.0	1	3.8	11, 18, 24	5.1	11.2
West Point, Ga	239	20	9.1	1, 2	3.5	24, 25, 29, 30	4.3	5.6
Eufaula, Ala	90	40	11.5	1	3.6	19	6.3	7.9
Alaga, Ala.	30	25	19.7	3	6.0	25, 31	8.8	13.7
Coosa River.								
Rome, Ga.	266	30	18.0	1	2.6	17-19	4.7	15.4
Gadsden, Ala.	162	22	17.9	2	3.5	29-31	6.6	14.4
Lock No. 4, Ala.	113	17	14.4	2	2.8	29, 30	5.6	11.6
Wetumpka, Ala	12	45	28.4	3	7.4	30	9.3	21.0
Tallapoosa River.								
Milstead, Ala.	42	35	21.1	1	3.0	18, 19	5.5	18.1
Alabama River.								
Montgomery, Ala.	323	35	26.0	3	4.9	30	10.1	21.1
Selma, Ala	246	35	28.3	4	6.3	30	12.4	22.0
Black Warrior River.								
Tuscaloosa, Ala.	90	43	41.3	1	8.8	30	14.8	32.5
Tombigbee River.								
Columbus, Miss	316	33	5.5	1, 2	— 0.2	30, 31	2.2	5.7
Vienna, Ala.	246	42	10.9	3	3.0	24-26	5.4	7.9
Demopolis, Ala.	168	35	29.2	4, 5	6.0	30	14.3	23.2
Leaf River.								
Hattiesburg, Miss	60	20	8.8	1	3.4	20	5.0	5.4
Chickasawhay River.								
Enterprise, Miss	144	18	12.0	2	2.0	29, 30	4.2	10.0
Shubuta, Miss	106	25	17.7	4	3.7	25-26	7.0	14.0
Pascagoula River.								
Merrill, Miss.	78	20	12.1	6	4.3	19	7.1	7.8
Pearl River.								
Jackson, Miss	242	20	10.7	8, 9	3.5	31	6.9	7.2
Columbia, Miss.	110	14	10.0	3	6.0	16-19	7.1	4.0
Sabine River.								
Logansport, La.	315	25	24.0	8	7.0	26	16.5	17.0
Neches River.								
Rockland, Tex	105	20	10.3	8	4.9	31	7.0	5.4
Beaumont, Tex.	18	10	2.8	18	1.3	27	1.9	1.5
Trinity River.								
Dallas, Tex.	320	25	6.4	6	4.7	2, 28-30	5.2	1.7
Long Lake, Tex.	211	35	19.5	9	6.9	26	10.5	12.6
Riverside, Tex.	112	40	24.2	1	3.0	25, 31	6.7	21.2
Liberty, Tex	20	25	22.6	3, 4	6.5	24, 27	11.3	16.1
Brazos River.								
Kopperl, Tex.	345	21	0.4	4-13	0.2	1-3, 14-31	0.3	0.2
Waco, Tex.	285	24	4.4	4	3.5	22-24, 31	3.7	0.9
Valley Junction, Tex.	215	40	0.4	1-3, 23, 25	0.1	11-18	0.3	0.3
Hempstead, Tex	140	40	3.9	1	— 1.1	27	0.3	5.0
Booth, Tex	61	39	2.9	12, 25-31	2.6	1	2.8	0.3
Colorado River.								
Ballinger, Tex.	489	21	1.0	1-20	0.8	21-31	0.9	0.2
Austin, Tex.	214	18	1.3	1, 2	0.8	17	1.1	0.5
Columbus, Tex.	98	24	7.0	3-7, 10, 12	6.4	1, 2	6.8	0.6
Guadalupe River.								
Gonzales, Tex.	112	22	0.6	1, 7, 9-11, 15-18, 25, 26	0.5	2-6, 8, 12-14, 19-24, 27-31	0.5	0.1
Victoria, Tex	53	16	1.7	3	1.2	21, 28	1.4	0.5
Red River of the North.								
Moorhead, Minn. (30)	284	26	.....	.....	.....	.....	.....	.....
Snake River.								
Lewiston, Idaho	144	24	5.5	1	2.3	18-29	2.9	3.2
Riparia, Wash.	67	30	6.0	2, 5	3.0	11, 16, 17, 29	4.0	3.0
Columbia River.								
Wenatchee, Wash	473	40	8.0	29-31	6.0	1, 2	7.0	2.0
Umatilla, Oreg. (28)	270	25	.....	.....	.....	.....	.....	.....
The Dalles, Oreg.	166	40	8.0	1	1.9	16, 30, 31	4.6	6.1
Willamette River.								
Albany, Oreg.	118	20	26.5	6	3.9	23-25	8.0	22.6
Salem, Oreg	84	20	21.0	6	2.5	23, 24	6.9	18.5
Portland, Oreg.	12	15	14.8	7	3.3	25, 26	7.1	11.5
Sacramento River.								
Kennett, Cal	323	23	12.8	29	2.9	24	5.1	9.9
Red Bluff, Cal.	265	23	19.6	4	3.8	22, 23	6.8	15.8
Colusa, Cal	156	25	25.1	6	7.4	4	16.4	17.7
Knights Landing, Cal	99	.....	16.5	11	13.5	25	15.3	3.0
Sacramento, Cal.	64	25	20.6	29	18.2	25, 26	19.4	2.4
Rio Vista, Cal. (a)	26	12	7.6	18	4.1	22	6.1	3.5
San Joaquin River.								
Pollasky, Cal.	203	10	4.0	29	0.6	25	1.3	3.4
Firebaugh, Cal	148	.....	8.2	30	3.4	4-6	4.3	4.8
Lathrop, Cal	49	15	15.0	31	8.8	5	11.6	6.2

(a) One day missing. Figures indicate number of days frozen.

Honolulu, T. H., latitude 21° 19′ north, longitude 157° 52′ west; barometer above sea, 38 feet; gravity correction, —0.057 inch, applied. January, 1907.

Day.	Pressure.*		Air temperature.				Moisture.				Wind.				Precipitation.		Clouds.					
							8 a. m.		8 p. m.		8 a. m.		8 p. m.				8 a. m.			8 p. m.		
	8 a. m.	8 p. m.	8 a. m.	8 p. m.	Maximum.	Minimum.	Wet.	Relative humidity.	Wet.	Relative humidity.	Direction.	Velocity.	Direction.	Velocity.	8 a. m.	8 p. m.	Amount.	Kind.	Direction.	Amount.	Kind.	Direction.
1	29.89	29.88	69.0	69.0	76	66	68.0	95	68.5	97	sw.	18	s.	6	0.10	3.46	10	N.	sw.	10	N.	s.
2	29.94	29.93	74.0	73.0	78	69	69.7	81	70.0	86	s.	7	se.	3	0.11	T.	9	S.	sw.	0	0	0
3	29.96	29.98	74.0	73.5	78	70	71.3	88	68.0	76	e.	7	ne.	3	0.00	0.00	8 2	S Cu.-n.	se. 0	0	0	0
4	30.00	29.94	74.4	74.3	81	71	69.6	79	69.0	77	e.	6	e.	8	0.00	0.00	10	S.	se.	10	S.	e.
5	29.91	29.88	75.0	75.0	79	70	69.5	76	71.0	82	e.	4	se.	7	0.00	0.00	7	Ci.-s.	s.	10	S.	se.
6	29.88	29.87	74.0	75.0	77	68	70.0	82	71.0	82	e.	8	se.	12	0.09	0.05	9	A.-s.	s.	0	0	0
7	29.88	29.89	72.0	71.5	75	67	70.5	93	68.5	86	s.	15	e.	3	0.04	0.68	10	N.	s.	8	S.	e.
8	29.92	29.90	70.0	70.5	74	67	67.0	86	68.0	88	ne.	7	ne.	10	0.15	0.01	7	Cu.	ne.	10	S.	ne.
9	29.89	29.90	72.5	71.0	77	67	69.0	84	69.0	90	ne.	4	se.	8	0.01	0.17	7 1	A.-s. Cu.	w. se.	10	N.	se.
10	29.89	29.85	71.0	74.0	78	68	68.0	86	71.0	86	n.	4	se.	10	0.14	0.02	10	S.	se.	10	S.	se.
11	29.83	29.83	71.6	74.0	76	71	70.0	92	73.5	98	e.	13	e.	15	0.12	0.18	10	S.	se.	10	N.	e.
12	29.89	29.86	74.0	74.2	82	70	70.5	84	73.2	95	se.	8	n.	3	0.15	0.02	10	S.	se.	10	N.	n.
13	29.94	29.96	72.7	72.5	76	70	70.4	89	72.0	98	ne.	2	e.	3	0.18	0.09	10	S.	se.	10	N.	e.
14	29.93	29.88	72.0	74.2	75	70	70.0	91	72.2	91	e.	8	s.	8	0.22	0.69	10	S.	0	5	S.	s.
15	29.78	29.77	73.5	71.0	75	66	71.2	90	68.0	86	s.	17	ne.	5	0.30	1.67	10	S.	sw.	0	0	0
16	29.84	29.87	72.4	71.2	77	66	70.0	89	68.2	86	ne.	5	ne.	3	0.02	0.00	2 1	A.-s. S.-cu.	nw. 0	3 2	Ci.-s. S.-cu.	w. ne.
17	29.96	30.00	72.0	73.0	78	68	68.0	82	70.0	86	ne.	5	ne.	4	0.00	T.	10	S.	se.	6 4	A.-s. S.	ne. 0
18	30.05	30.07	72.5	72.0	80	67	68.0	80	70.0	91	0	0	n.	4	0.00	0.00	few.	Cu.	0	10	S.-cu.	n.
19	30.07	30.01	72.5	70.0	78	66	68.3	81	67.0	86	0	0	n.	7	0.00	0.00	5	A.-cu.	w.	1	A.-s.	n.
20	29.99	29.99	71.0	69.5	76	64	67.0	81	67.0	88	0	0	ne.	3	0.00	0.04	5	Ci.	n.	1 few.	Ci. Cu.	0 0
21	30.00	29.99	71.2	71.0	76	65	67.0	80	66.0	77	ne.	4	ne.	3	0.00	0.00	2	Cu.	e.	9	S.-cu.	ne.
22	29.98	29.95	71.0	71.5	80	64	65.3	74	67.0	79	ne.	2	e.	1	0.00	0.00	1 few.	A.-s. Cu.	0 0	0	0	0
23	29.95	29.88	69.0	74.5	77	67	67.0	90	69.5	78	0	0	sw.	9	0.28	0.00	10	S.	s.	9	Cu.	sw.
24	29.91	29.93	72.5	72.2	77	66	68.0	80	69.2	86	ne.	4	nw.	2	0.12	0.49	6	S.-cu.	sw.	9	S.-cu.	nw.
25	29.97	29.96	73.0	71.5	79	67	67.0	73	66.0	75	ne.	1	ne.	9	0.00	0.00	0	0	0	0	0	0
26	29.98	29.94	73.4	71.0	79	66	65.0	63	64.0	68	ne.	2	ne.	1	0.00	0.00	few.	Cu.	0	few. few.	S.-cu. Cu.	ne. e.
27	29.94	29.87	71.0	72.0	78	67	63.0	64	64.0	65	ne.	1	ne.	1	0.00	0.00	9	A.-s.	n.	8	Cu.	ne.
28	29.84	29.81	66.0	70.2	75	65	64.0	90	67.2	86	e.	9	ne.	1	0.56	T.	8	N.	w.	few.	Cu.	se.
29	29.81	29.77	71.0	71.0	75	63	64.0	68	66.0	77	ne.	1	e.	3	0.00	0.00	2	A.-s.	s.	1	Cu.	se.
30	29.75	29.74	72.5	66.0	77	64	67.0	75	63.2	86	s.	15	e.	5	T.	1.22	7	S.-cu.	s.	10	S.	e.
31	29.78	29.84	74.0	73.0	75	67	69.0	78	71.0	91	s.	17	s.	18	0.03	0.81	10	S.	sw.	10	S.	s.
Mean	29.914	29.901	72.1	72.0	77.2	67.2	68.1	82.1	68.7	84.6	ne.	6.3	ne.	5.7	2.62	9.60	7.0	S.	se.	6.0	S.	ne. e.

Observations are made at 8 a. m. and 8 p. m., local standard time, which is that of 157° 30′ west, and is 5h and 30m slower than 75th meridian time. * Pressure values are reduced to sea level and standard gravity.

RAINFALL IN JAMAICA.

Thru the kindness of Dr. H. H. Cousins, chemist to the government of Jamaica and now in charge of the meteorological service of that island, we have received the following table:

Comparative table of rainfall.

[Based upon the average stations only.]

DECEMBER, 1906.

Divisions.	Relative area.	Number of stations.	Rainfall.	
			1906.	Average.
	Per cent.		*Inches.*	*Inches.*
Northeastern division	25	21	5.46	11.19
Northern division	22	48	2.04	5.95
West-central division	26	19	0.31	3.60
Southern division	27	34	0.42	2.89
Means	100	....	2.06	5.91

The rainfall for December was therefore less than half the average for the whole island. The greatest fall, 16.38 inches, occurred at Mount Holstein in the northeastern division, while no rain fell at Westfield in the northern division and at several other stations in the central, sub west-central, and southern divisions.

JANUARY, 1907.

Divisions.	Relative area.	Number of stations.	Rainfall.	
			1907.	Average.
	Per cent.		*Inches.*	*Inches.*
Northeastern division	25	21	5.41	8.02
Northern division	22	49	2.70	4.11
West-central division	26	19	1.47	2.98
Southern division	27	30	0.73	1.94
Means	100	....	2.58	4.26

The rainfall for January was therefore considerably below the average for the whole island. The greatest fall, 21.39 inches, occurred at Greenvale in the northeastern division, while no rain fell at Kendal, or Manchester, in the west-central division, also at the Lunatic Asylum and the Public Works Office, Kingston, in the southern division.

Chart I. Hydrographs for Seven Principal Rivers of the United States, January, 1907.

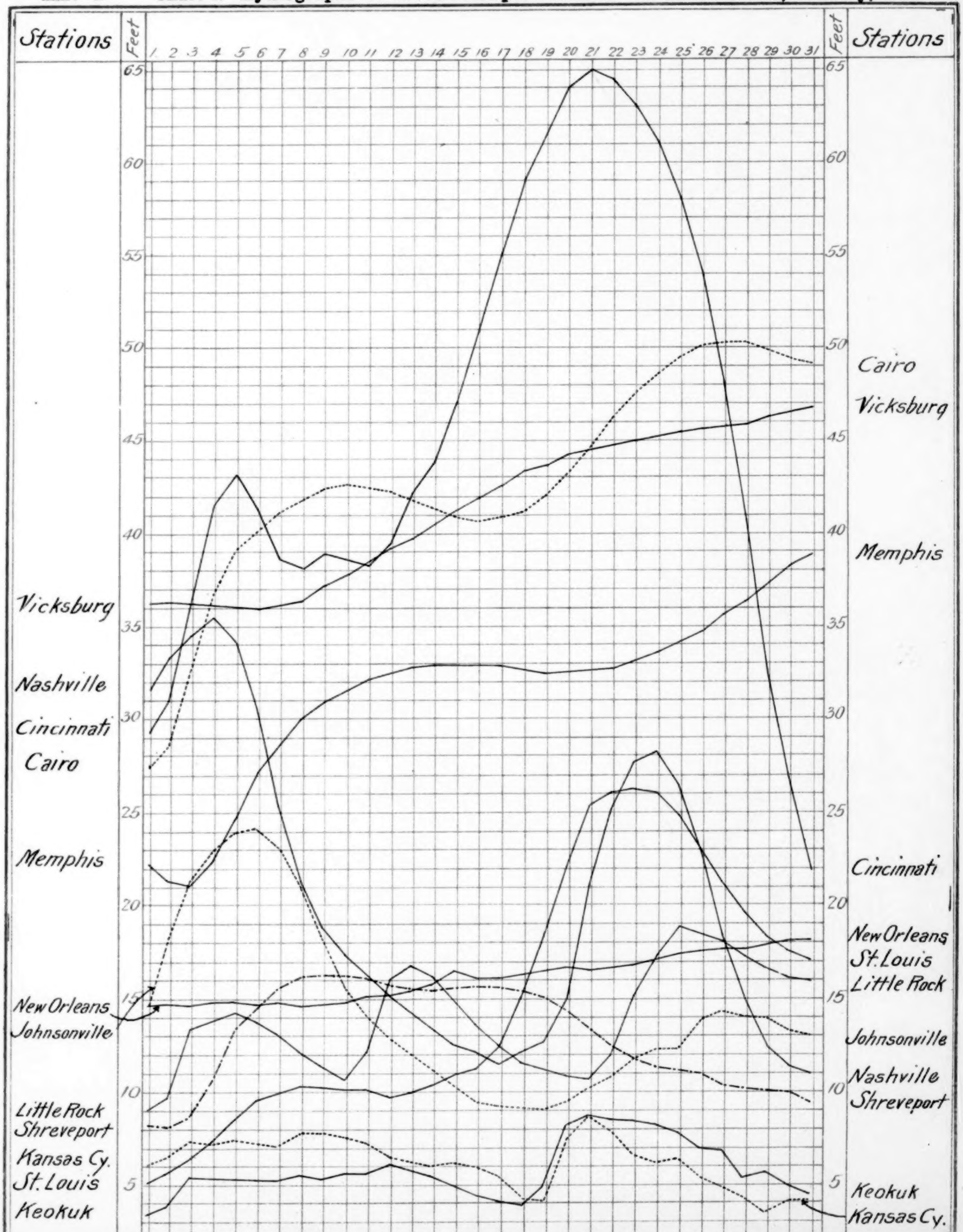


Chart II. Tracks of Centers of High Areas, January, 1907.

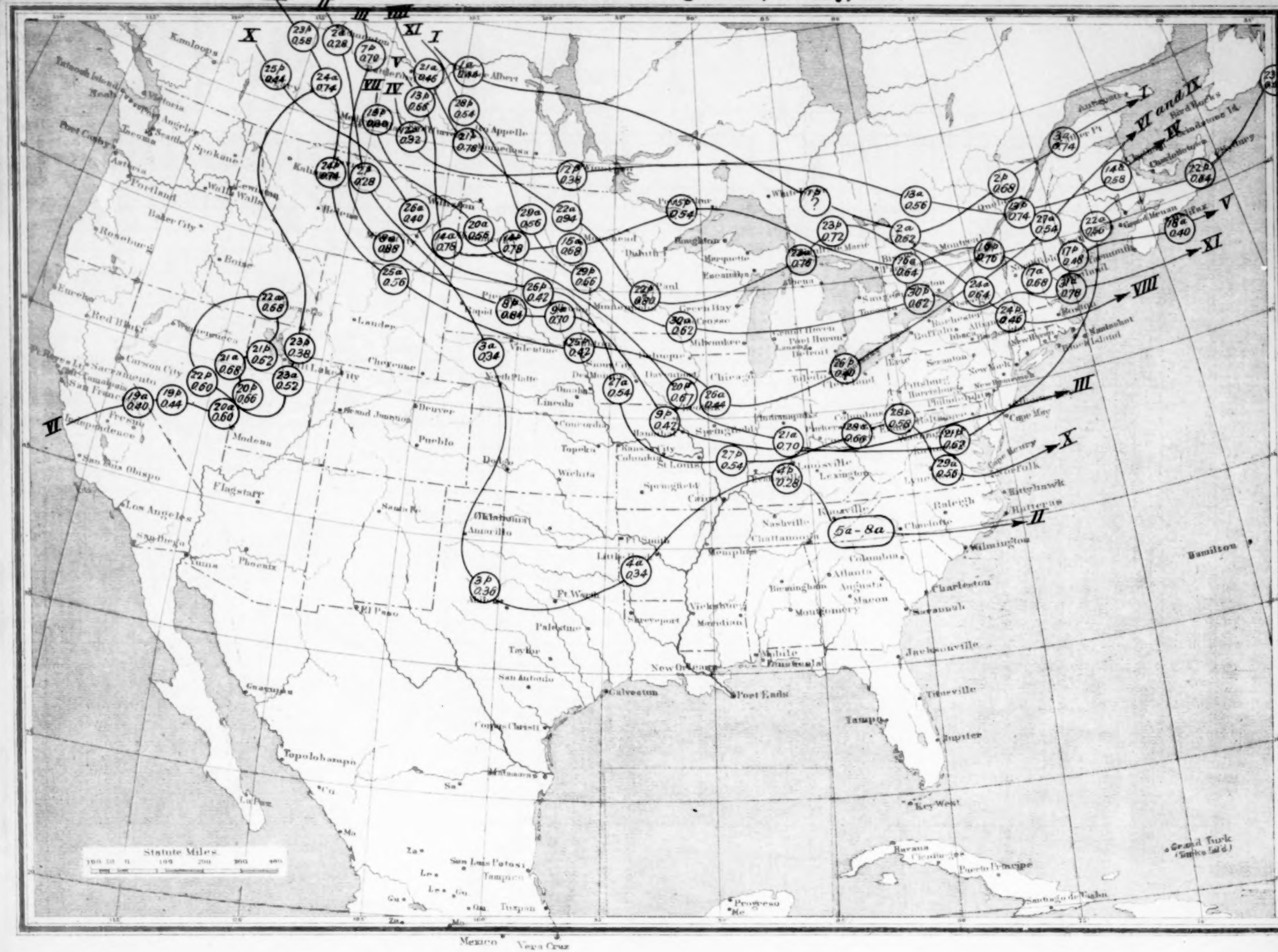


Chart III. Tracks of Centers of Low Areas, January, 1907.

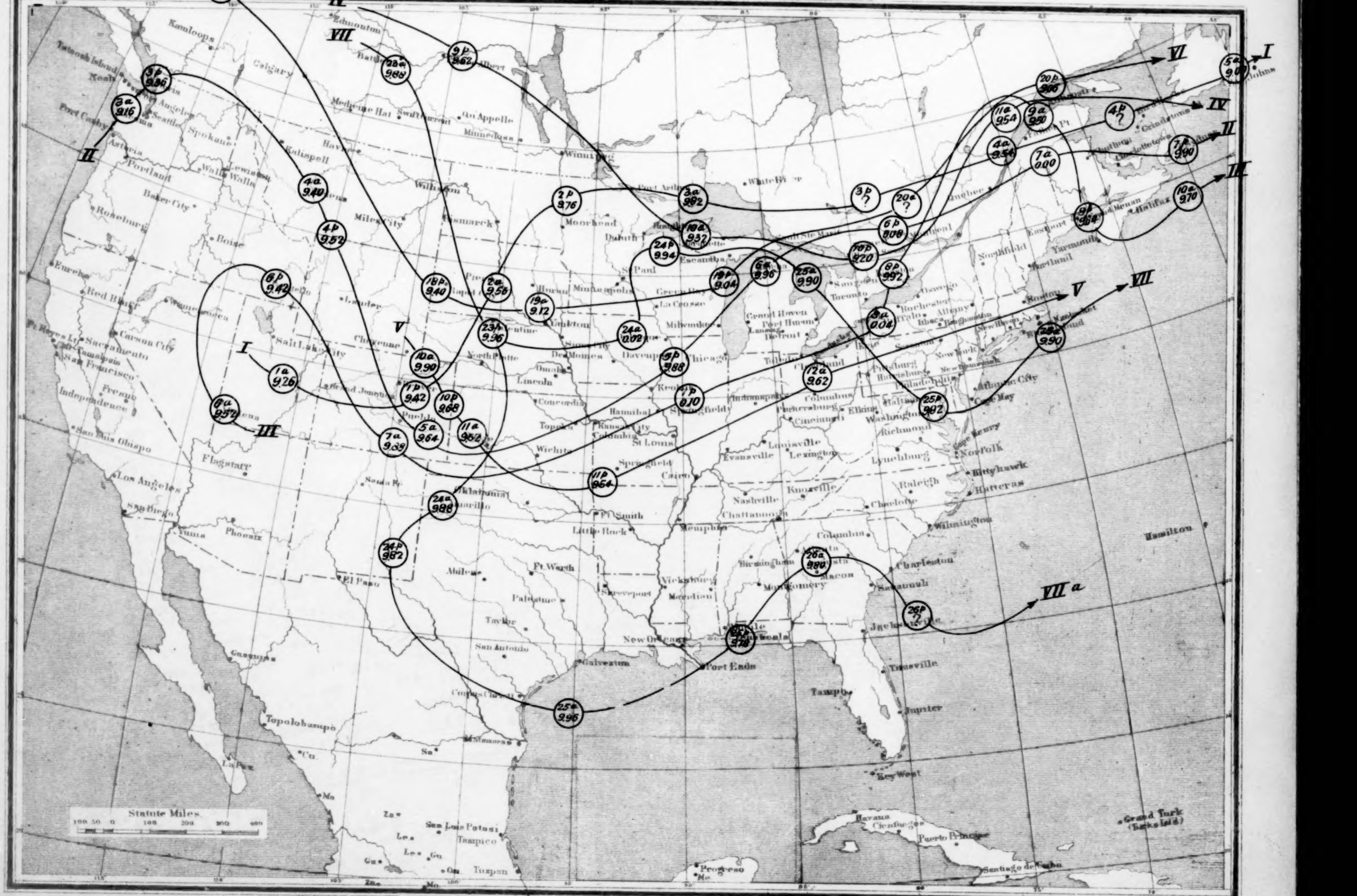


Chart IV. Total Precipitation, January, 1907.

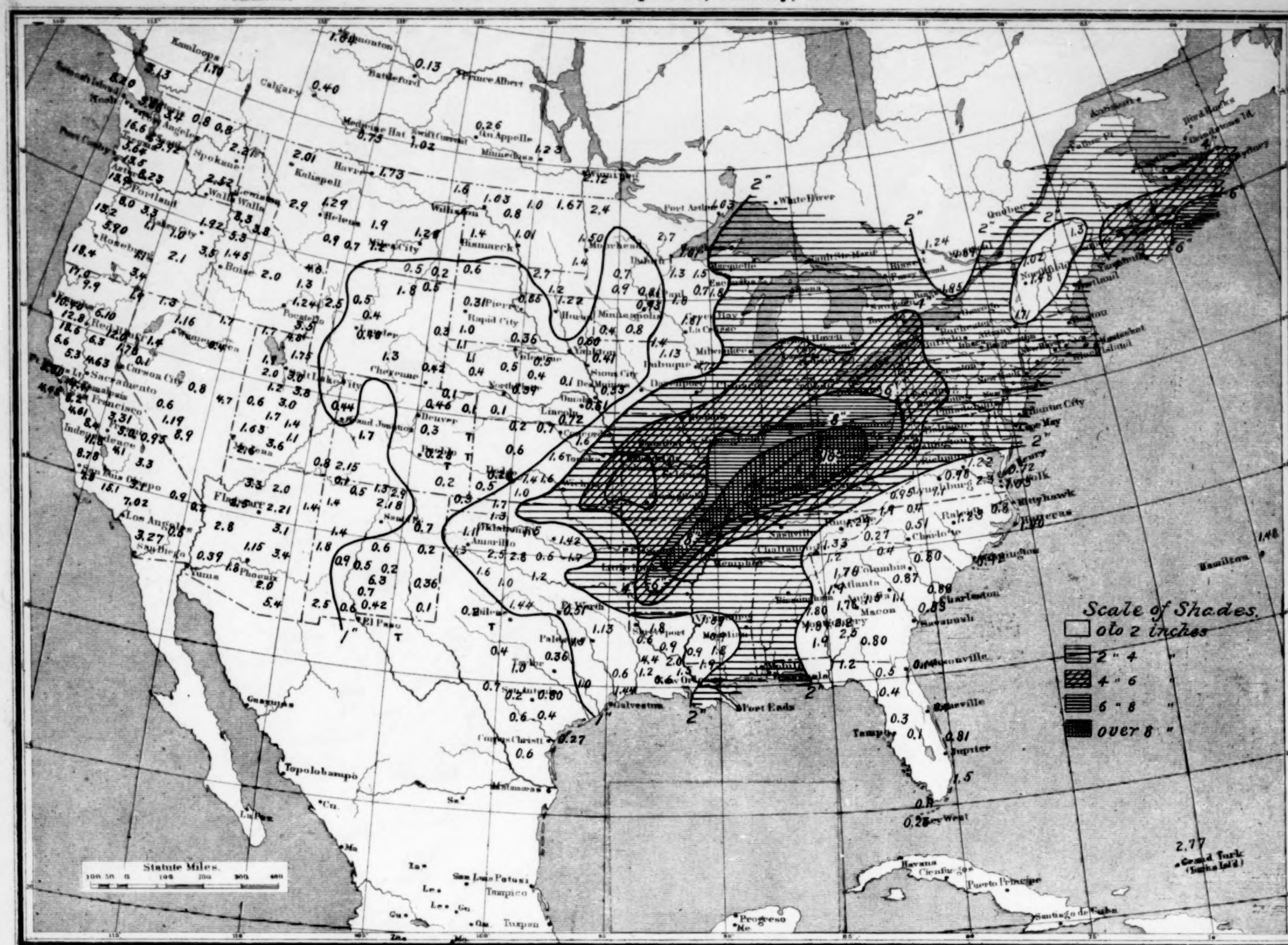
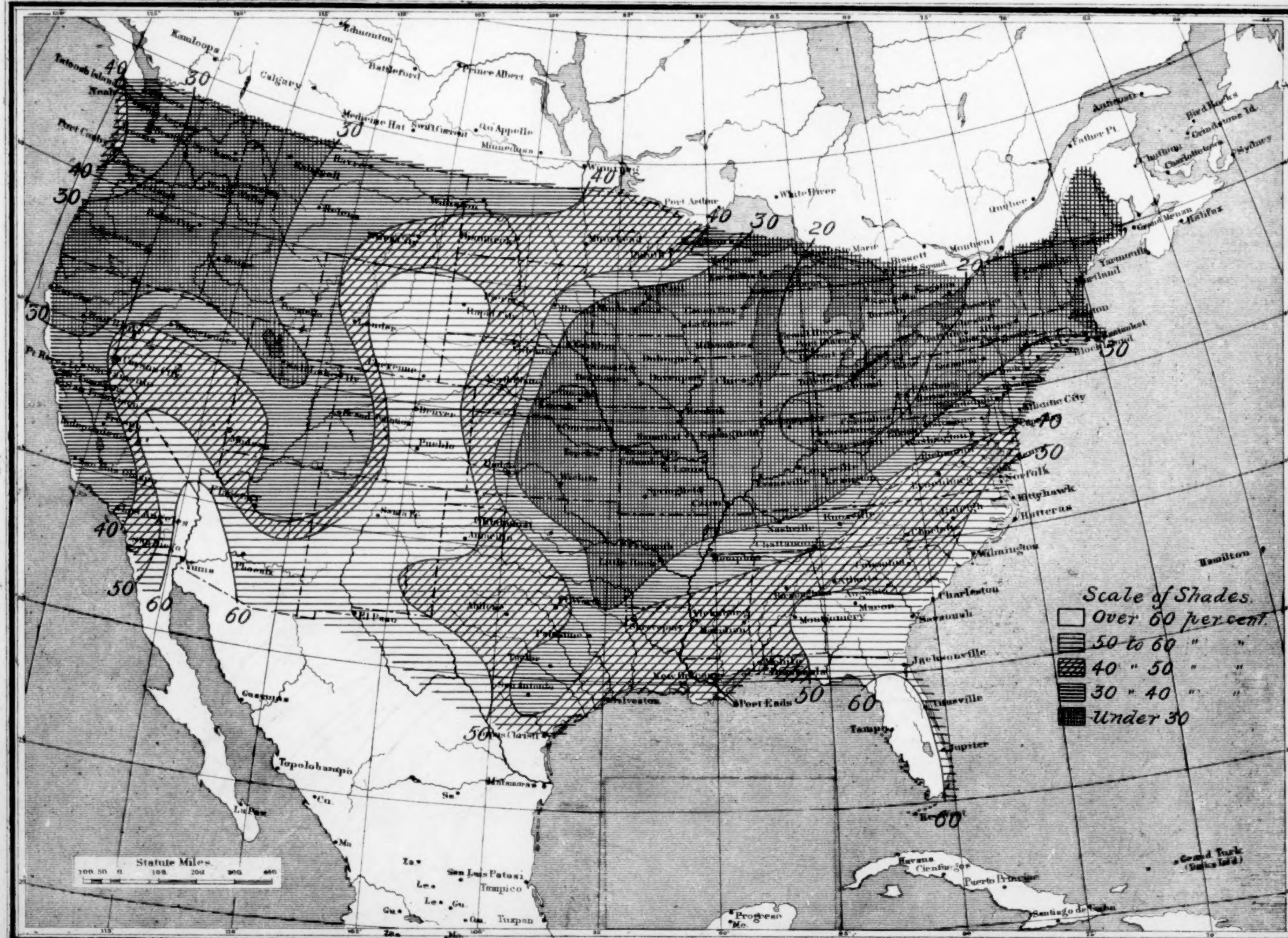


Chart V. Percentage of Clear Sky between Sunrise and Sunset, January, 1907.



• Barkerville **Chart VI. Isobars and Isotherms at Sea Level; Surface Wind Resultants, January, 1907.**

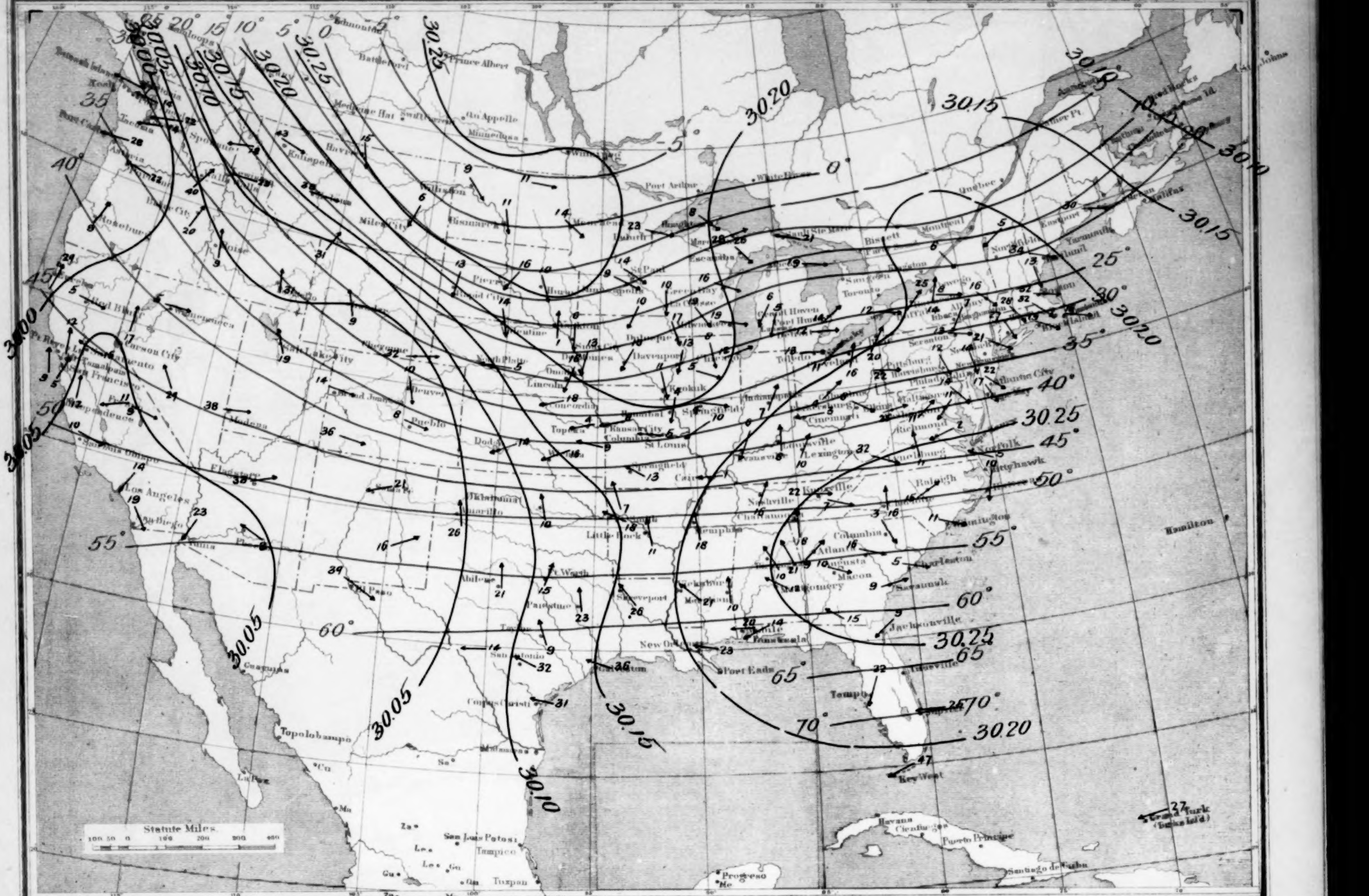
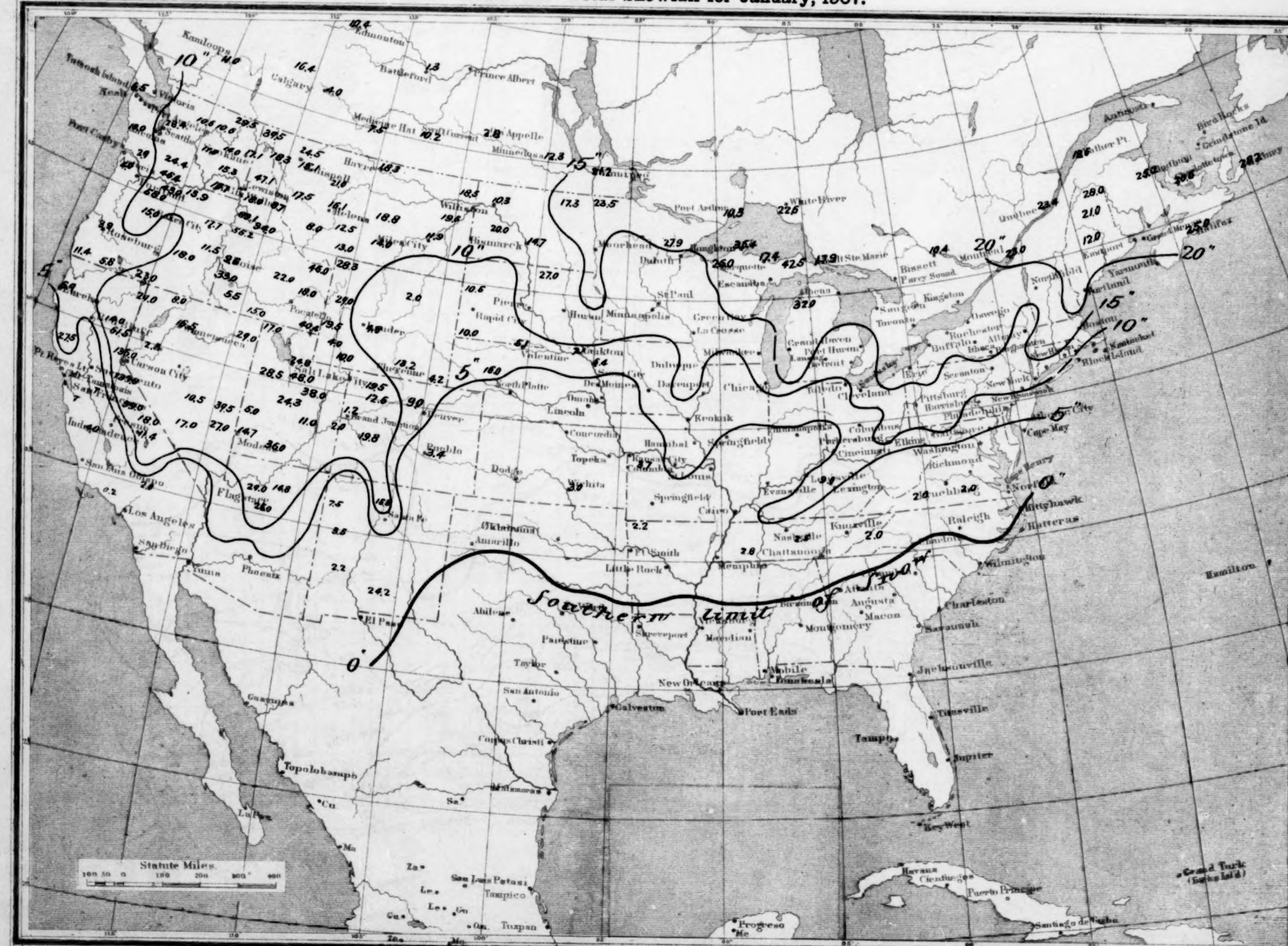


Chart VII. Total Snowfall for January, 1907.



• Barkerville

Chart VIII. Depth of Snow on ground January 31, 1907.

Chart IX. Hydrographs of the Ohio River, January, 1907.

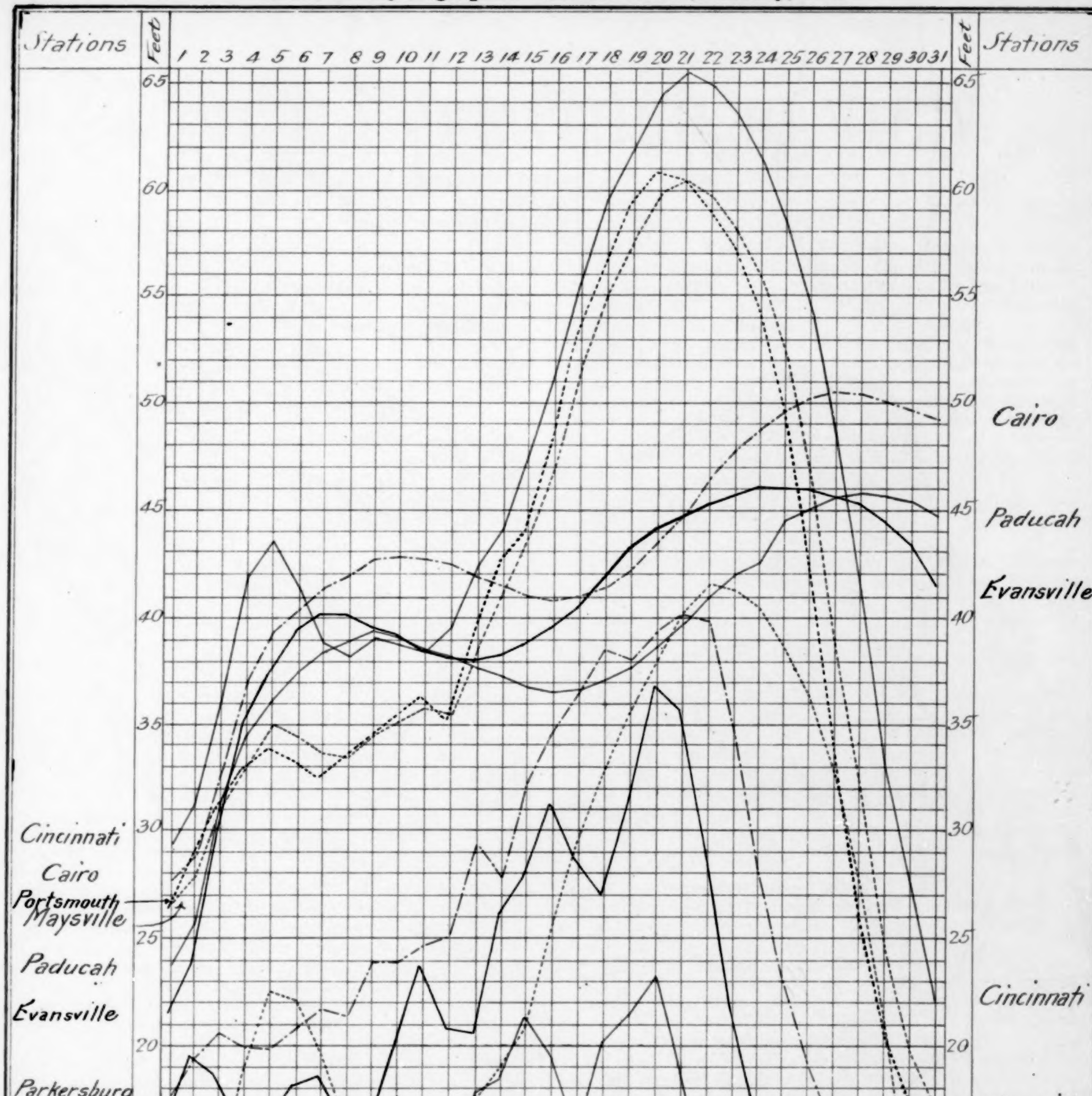


Chart X. Rainfall in the Ohio River Watershed, January, 1907.